# SWEDENBORG'S

# COSMOLOGY



LILLIAN G. BEEKMAN

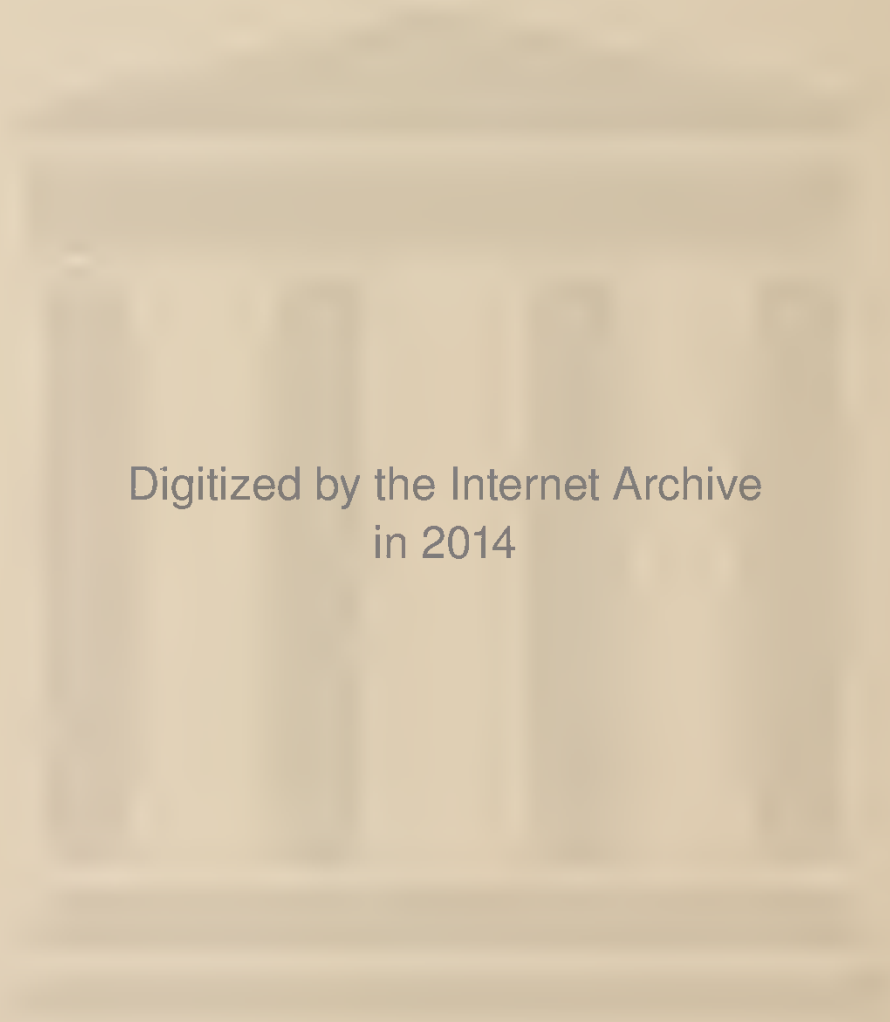
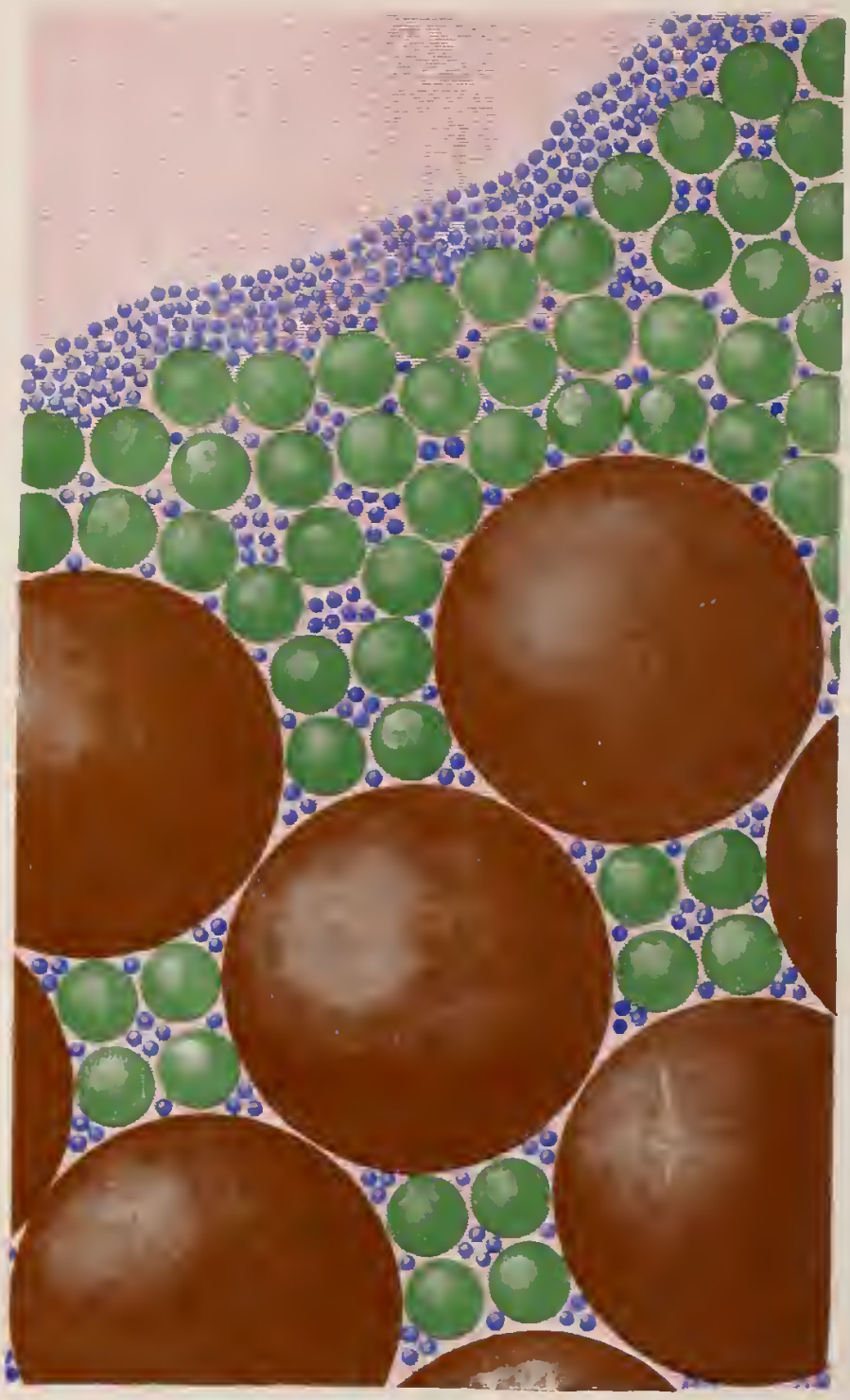


Plate 1.



THE INTER-RELATION OF THE FOUR ATMOSPHERES.

The relative sizes of the bullæ, as here represented, are only ***suggestive*** of their actual difference.

# OUTLINES

OF

# SWEDENBORG'S COSMOLOGY

BY

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Adv.—The Adversaria.
A. E.— The Apocalypse Explained.
A. K.—The Animal Kingdom.
Ath. Cr.—On the Athanasian Creed.
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# CHAPTER I.

## THE FINITING OF INFINITY.

THE FIRST FINITING OF INFINITY is in the nature of vortex rings small as points, produced in the substance of the Infinite. These are the "natural points" of Swedenborg's *Principia,* and the "simples" and "primitives" of his work *On the Infinite.* They are the primitives of the Spiritual Sun. They are "the Only Begotten," "the nexus," the Logos, the seed of creation.

Around the Spiritual Sun are two successive radiant belts; these are the volumes of the first and second finites. The third thing in succession is an atmosphere, which is the atmosphere of the celestial heaven and of the universe. By this atmosphere the Lord is immediately and universally operative and active in the spiritual world and in the natural.

GOD, WHO IS INFINITE, the Divine Esse, the I Am, is substance in Itself, and as the Infinite and the only substance, He is everywhere. There is no place where He is not. Therefore the universe and all the finite or bounded things thereof are brought

forth in Him. The universe is finited only in the Infinite.[1] Hence there exists an apparent vacuum which still is not a vacuum; for an interstitial nothing is not possible. What appears empty is filled by the living Substance in Itself, the Divine which Is.[2] Thus in God we live, and move and have our being.[3]

God wills to create finite, bounded, recipient forms, individuals, which He can both infill, and act upon.[4] God, by the predicates of His living Esse, could not bring those recipient individuals into existence by fiat. But He could form them from small discrete particles of substance, or substantials, previously produced.[5]

God, the Origin of created Substances. What is the source of these substantials, these minimal, first finited particles of substances, these primordial substantials from which God creates His universe? Since their creation by fiat, or from nothing, is precluded,[6] therefore the Infinite, the living expanse,

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[1] Principia, part. III. chap. I. 11.

[2] J. Post. 265. D. L. W. 82.

[3] D. L. W. 30. E. A. K. part II. 238. A. E. 1121.

[4] D. L. W. 53. T. C. R. 30.

[5] D. Love. II. Principia part. I. chap. III. 7. D. P. 6. A. E. 1121

[6] D. L. W. 55, 282, 283.

Substance in Itself, must be the Source and Origin of these minima of substance, of these primordial leasts, which are to act as the seeds and primitives of creation. There is no other substance from which recipient forms may be created.[7]

God, the Infinite Esse, must needs give of His own substance to frame creation. This is the sacramental gift, as of His flesh, to be the bread and the flesh of His creatures.[8]

The primitive substantials of creation must be formed from the substance of the Infinite Esse. God must give portions of His own substance to be the *substantia prima* from which He creates all things. God, therefore, must first finite His Infinity as a preparation for a universe.

THE MODE OF THE FIRST FINITING. The concept of the accommodation of Infinity to finiteness, in order that the finite may exist, arises here. How can the Infinite God, who is Substance Itself, finite His Infinity, without destroying His own non-finiteness? In what manner can the accommodation of the Infinite to finiteness be given, without the es-

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[7]D. P. 46. Principia, part I. chap. II. 1. D. L. W. 282.

[8]Principia, part I. chap. II. 1. The Infinite, chap. I. sec. III. 5. sec. IV. 2. D. Wis. I. A. E. 617. Ath. Cr. pages 8. 17. 19. 32. 41.

sential infringement of the Infinity of God, and of His Infinite Oneness?

This problem is perhaps the most central among the problems of creation; and the answer will qualify all our thoughts of God the Creator, and of the relation of the universe to Him.

Swedenborg approaches this problem directly; and the answer he gives impresses its stamp and feature on his whole system of the universe. It underlies as a very foothold the Theology of the New Church, and is regnant in it from first to last. It conditions alike the heavens and the earths, the organic and the inorganic kingdoms.

SWEDENBORG'S DEFINITIONS. In following Swedenborg we approach this subject in a series of comparative definitions of what is meant by *Infinite* and *finite:* a series covering *expanse, origin, duration, characteristics of substance,* and *activity* or *motion.*

These definitions are as follows:

*Expanse,* in relation to the Infinite signifies that which is without bound, term, or limit; when predicated of the finite, it signifies that which is comprised within definite terminations, that which is of limited extense, bounded.

*Origin* cannot be predicated of the Infinite, since as to substance the Infinite is self-existent; is not

framed or put together of something in prior existence; is not concreted from prior entities. But origin is predicated of all finite entities; for a finite is always framed or put together of parts already existent; always owes its substance to something else, to something prior to itself.

Neither can *duration* be predicated of the Infinite, since it is without bound or term, without beginning or end, always was, and is, and will be. But for all finite entities there are distinct ages, epochs, periods of time, prior to which they did not exist; and an hour in which they began to be formed. There is also an hour in which they are broken up or come to an end, their substance being scattered to enter into combination with other particles, in other forms of some other period of duration. For all created entities or individuals,—save the universe as a whole, solar systems, and man,—have such an end. Animals have it, and almost all inorganic individua, although the latter have the longest duration.

In respect to *characteristic of substance*, the Infinite is one and indivisible. It does not consist of parts, or is not compounded of smaller particles. It is one purely continuous substance.[9] In it, infinite things are distinctly One.

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[9]Principia, part I. chap. II. 1; A. E. 1121; and in the Writings *passim*.

The *characteristic of finite substance* is that it is framed of myriads of distinct particles. It therefore consists of parts, or is compounded of smaller discrete particles contiguous to each other. It is not a continuous substance.[10]

And finally in respect to *activity* or *motion,* the Infinite is infinitely active. It is without any passivity or inertia. It is therefore frictionless. The current of its motion, as it is in itself, never bounds, never encloses, nor finites, that is, never describes a circle; for to describe a circle of any diameter is to describe and bound an area of that diameter. Infinite motion cannot describe an area, or make an enclosed field.

On the other hand a *finiting* motion is a motion the current of which defines or bounds, and discovers lines of least resistance, of opposition, of reaction with or against the current. The simplest motion which describes a boundary is a circular motion. Therefore a finiting motion is a circling motion, or that which describes a circle or closed field of some diameter.[11] The ideal of the circular

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[10]Principia, part I. chap. II. 1. 8; chap. III. 7; The Infinite, chap. I. sec. IV. 2, sec. XV. conclusion; chap. II. sec. I. 6.

[11]Principia, part I. chap. II. 21; chap. IV. 18. part 2. line 48.

motion, that which comprises in itself every type and degree of circling motion, is the circulo-spiral, or perpetually vortical motion.

THE ACCOMMODATION OF THE INFINITE TO THE FINITE. Under which of these five definitions can we see possible a first accommodation of the Infinite to the finite, a primal finiting of the Infinity of God, which will not infringe upon the Infinity of the Creator, and which will contain the seed adequate to the purposes of creation?

The accommodation of the Infinite to the finite, under the first, second, and third heads, viz., under *expanse, origin, and duration,* are at once negatived; on their faces they are absurd, impossible, and incompetent to the purpose.

The accommodation of Infinity to finiteness under the fourth head, namely, *character of substance,* is also negatived. For since the Infinite, as Substance Itself, is a unity or a one, purely continuous, the distinction and marking off of the portions thereof, by any means involving severance, cutting off, separation, while it would indeed finite the portions so given and cut off, would also finite the remainder; and so in destroying the continuity of the Infinite, it would essentially infringe upon the oneness of the Creating Substance. Moreover that

which is severed from its first is by that act annihilated.

Under the fifth head, *activity* or *motion,* Swedenborg places the primal accommodation of the Infinite to the finite, or the first finiting of Infinity. Under this head alone accommodation is at once possible without essential infringement of the non-finiteness and unity of the Infinite, and adequate to the purpose; at once setting aside, distinguishing and defining portions of the Infinite Substance to be the *substantia prima* and seed of creation; and by the very mode of defining, imparting to the portions thus defined and appropriated, certain active powers of motion, capable of being a further means to their self-composition or concretion into a series of derivative finites, substantials, or substantiates; and abiding as a spring of reflexing motor force in all things of creation forever. Moreover in finiting by means of motion, there is no actual severance from the substance of the Infinite.

The Production of Vortex Rings. The first finiting of Infinity, is, according to Swedenborg, the production of minimal and simplest points of circulo-spiral motion, that is, the production of vortex rings, small as points, *in the Substance of the Infinite.* The interior conatus to circulation of these vortex points is circulo-spiral; so that the whole point is

not only in a vortex flow, but also gyres continually around its own axis.[12]

So long as the vortex flow of these minimal rings is continued and sustained by the will of God, they continue to exist as entities in the Substance of the Infinite; they continue in one aspect distinct and bounded, enclosed and limited; that is, the circling motion of their flow is a first delineation of finiting.

These simple minimal vortices were existent in the Infinite before any finite or concrete entity had existence.[13] They are to be called the medium between the Infinite and the finite.[14] They are not only the primitives of the first substantials or composites of creation, but they are its force and life.[15] They are immediately Divine and superlatively perfect.[16] In them are supremely involved the ends of the universe, its human result, and the providence of the future.[17]

THE NATURAL POINT. The natural points, there-

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[12]Principia, part I. Chap. II. 12. 21. 22; Chap. III. 19.

[13]Principia, part I. Chap. II. 8. 12.

[14]Principia, part I. Chap. II. 10.

[15]Principia, part I. Chap. III. 6. 7. II. 10; The Infinite, Chap. I. sec. IV. 3.

[16]Infinite, Chap. I. last page; Chap. I. sec. V.

[17]The Infinite, Chap. I. sec. XI, 2. 3; Principia, part I. Chap. II. 5.

fore, are the first substance and source of that which, in its derivative composition, we call the created universe. They are the inmost, the first and primitive both of the spiritual world and of nature.[18] They are produced by the Infinite, and are the immediate act of the Infinite finiting itself by reactive motion. They are in space without space; for the Infinite, prior to this first finiting, was everywhere existent without space; for space was not until the lower finite came into existence, being simultaneous and coincident with that act. They exist in all space without space in relation to the Divine; but in relation to derivative creation there is in them the first beginnings and motions of space. Hence space and time have their origin in God, who is in all space and time without space and time.[19]

The natural points or first simples are thus the medium between the Infinite and the finite; they are the first entia, and in their multitude and activity they so fill all the spaces of the universe that a vacuum is precluded. Their composite is *the first substantial.*

*First substantials* are the first boundary of matter; that is, they are the first of the series of concrete

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[18]Ath. Cr. page 41.

[19]T. C. R. 31.

substances, the beginning and end of the Daedalian thread from which the compound universe is woven. In them the natural points or primitives become as it were a part of nature, since nature begins with them. For the natural points have in them an end and purpose toward the creation of man, for the sake of whom nature is, with all its suns and stars and solar systems.

For the leasts and greatests of every series mutually regard each other, and have coincident existence in the Creative Will. Thus the least vorticles of motion regard the greatest; the motion of singulars regards the motion of mass; the motion of natural points regards solar centres and systems; and both together, operating as one in God, regard the production of man, as a sensitive microcosm, loving God and reacting to Him.

THE PRODUCTIVE ACTION OF THESE NATURAL POINTS is as follows:—

The perpetually vortex conatus in the natural points, or first simples of finition, is such that it sets these points into a local motion or gyre, of a pattern emulous of its interior circulation. This is of immense importance since it involves the law and the pattern of all the derivative production of the

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[20]Principia, part I. Chap. II. 22.

series of finites or substantials.[20] And from this it is that all things which involve an end, constitute a circle.[21]

All the motion of these simples is thus perpetually reflexive or circular, all their action, all the lines in which they flow. For what they are within, that they do, that they act. That which is the pattern of their interior conatus or endeavor, that they reproduce in all their derivative motions.[22]

Moreover, the perpetually reflexive flow of these vortex points, these primitives and simples of finition, involves something deeper, more living still. In them is present in very figure and embodiment the image which manifests the inmost action of love, of love as a substance. For all love tends to return as a circle to the source from which it came.[23] And love exists as a substance in God the Creator.[24] There is thus a conatus in each thing of creation to return to its source. Therefore the primitive force in a simple is most perfectly adaptable and modifiable along all human building lines; for the Infinite is capable of varying it in infinite ways.[25]

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[21]A. K. 260. note s.

[22]Principia, part I. Chap. III. 19 part 2.

[23]Divine Love X. 2.

[24]T. C. R. 76.

[25]Principia, part III. Chap. II. 4. parts 2. 3.

Moreover in this perpetually reflexive, or circulo-vortical flow, all powers afterwards manifested in mechanics are actively infolded.[26]

It is indeed this perpetually circling character, both of their interior conatus, and of their operation, in which resides the power which enables the primitives, which are the first finiting of Infinity, to composite themselves, to flow together into new compound entities, substantials, or finites;[27] into substantials or finites of definite form, size, power of permanent cohesion, and of derivative motion;[28] and in fact into substantials of definite powers to produce a *series* of such substantials, or finites, or concrete corpuscles, of five descending grades or degrees.[29]

The Primitives of the Spiritual Sun. This series of finites or substantials originating in the primitives, points, or simples of the *Principia,*[30] are the same with the substantiates originating from the primitives of the Spiritual Sun.[31] In the perpetually reflexing conatus of the points or simples of finition, all those things have their in-being, which

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[26]Principia, part I. Chap. III. 24. 26; Chap. IV. 18.
[27]Principia, part I. Chap. III. 1-6.
[28]Principia, part I. Chap. III. 11. 12. 14.
[29]Principia, part I. Chap. IV. 2. 5. 16.
[30]Part I. Chap. III. 2; Chap. IV. 2. 5. 16
[31]D. P. 6. T. C. R. 33

exist throughout the series of finites or substantiates, successively compounding themselves, even to the most gross and ultimate, such as we see existing in the world.[32]

The importance of this conatus and potency of circular motion in the primitives or vortex points, is seen when we consider that the primitives and firsts of finition constitute what is called the Spiritual Sun, which is the prime substance, the first finiting of the Infinity of God, the primitives of which are given to be primordial seeds of creation.[33] The intrinsic circulo-spiral motion of these primitives of the Spiritual Sun, therefore, acts as the instrumental means in compounding the series of derivative substantiates or finites; a series composed of five distinct grades of composite vortex-ring corpuscles, destined for distinct grades of use, both in the composition of the successive degrees of auras or atmospheres, and in the composition of distinct degrees of structure in recipient organic forms, reactive or reflexive to the Divine.

Thus by means of the perpetually reflexive motion inhering in the primitives of the Spiritual Sun, that is, in the firsts or simples of finiting, a series

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[32]Principia, Part I. Chap. III. 13.

[33]T. C. R. 27. 33.

of substantials or finites is produced, or concreted, by which the substances and forces of the universe are successively finited "more and more."

Moreover, it is from this perpetually reflexive impetus, in the primitives or simples of the Spiritual Sun, and derived from them into all their composites or substantials,—embodying the generic impulse of love as a substance in God,—that the elementaries or active atmospheres derive their peculiar and characteristic habit and nature of motion which is always circular. So that the very reaction of the auras to any action, or beginning, or centre of inciting force, is always to run into a vortex or circling gyre;[34] nor do they ever move by other than circling lines.[35]

It is from the same primitive substantial cause that animate forms are characterized by some kind of interior circulation;[36] for the order and round of the bloods arises from this deep and living conatus in the leasts of the substances from which they are framed.

There is an emulation of a circulation even in the non-animate kingdom. Vegetables have it; the mole-

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[34]Principia, part I. 25. Chap. II; chap. III. 26, 27.

[35]Principia, part I. Chap. VI. 33, 37, 38, 39; part II. Chap. I. 1. 2; A. K. 288. note t. 260. note s.

[36]D. Wis. X. 3.

cules of the mineral kingdom have it, and crystals themselves strive toward it internally.[37] Moreover, in order that the molecules of the mineral kingdom may not exhale and emanate themselves out of existence, by the ethers which flow through the molecular pores and channels, as bloods through vessels, there is a perpetual renewal of the form, and a perpetual giving forth of effluvial spheres, as its contribution to the finer uses of the world. That which has not some type of circulation does not exist, or swiftly ceases to exist, dissolves, dissipates. Thus the primitives of the Spiritual Sun by means of their circling motion give some stamp and feature of themselves upon every substantiate form, derived or moulded from them,—the image of the Divine Love going forth and returning to Itself.

THE ESSENTIAL CHARACTERISTICS OF THE NATURAL POINT. The firsts of primordial finiting, the simples and natural points of the *Principia*, standing as intermediate between the Infinite and the finite,[38] are the same with the primitives and simples of the work *On the Infinite*.[39] These primitives and simples are there called the nexus between the Infinite and the finite. The name they are known by

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[37]T. C. R. 499.

[38]Principia, part I. Chap. II. 10. 12.

[39]Chap. I. sec. IV. 2.

in the Sacred Scriptures, is the Only Begotten, the Son from eternity.[40] They are themselves infinite.[41] They are the first creative essence mentioned in the *Spiritual Diary,* (n. 4847), Itself Divine or Infinite, and Man in conatus or beginning, (*fieri*), or Man reflexively. They are therefore the "Divine Essence," related to the Infinite Esse, as the Essence is related to the Esse, in the *True Christian Religion* (nos. 18, 36). They are the Existere of God Man described in *Divine Love and Wisdom* (n. 14); in whom Esse and Existere are one, yet one distinctly; the Esse being the soul of God Man, the Existere His Divine Body. Of the Divine Essence the Spiritual Sun consists;[42] and it is alive.[43]

These simples, primitives, or points, are therefore not dead, but are living, life itself, Infinite. They are not the fortuitous points "of no predication and therefore not in themselves anything," nor the atoms of Epicurus, nor the monads of Leibnitz, nor the simple substances of Wolf; and so are not what is condemned in the *True Christian Religion*, n. 20, and *Divine Providence,* n. 6.[44] They are the Infinites

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[40]Infinite, Chap. I. sec. X. 3, 4.

[41]*Ibid.*

[42]T. C. R. 29.

[43]D. L. W. 163-166.

[44]See also Infinite, Chap. I. sec. IV. 8, 49; E. A. K. part I. 612. 618. 622. part II. 242.

of God Man, and the origin of the finites of the universe.[45] They are the seeds of the universe, the sole substance of which all substances are made.[46] They involve supremely all the human end of creation, sustainment, providence, redemption.[47] For ends are in the Spiritual Sun, causes in the spiritual world, and effects in the natural world;[48] ends are then Infinite. Hence in the finiting conatus of the points or simples, all the human ends of the created universe have their in-being, and are supremely involved and embodied in them; while their derivative activity or motion presents as in a figure the universal endeavor of love to return as by a circle to its source.

Moreover, as has already been indicated, the circling figure of the motion of the primitives is the sole instrumentality needed, to enable them to conflow together by myriads, and impel them to coalesce into compound vortex ring corpuscles. These are the substantials, substantiates, or finites.[49]

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[45]D. L. W. 17, 155, 169. Principia, part III. Chap. I. 1.

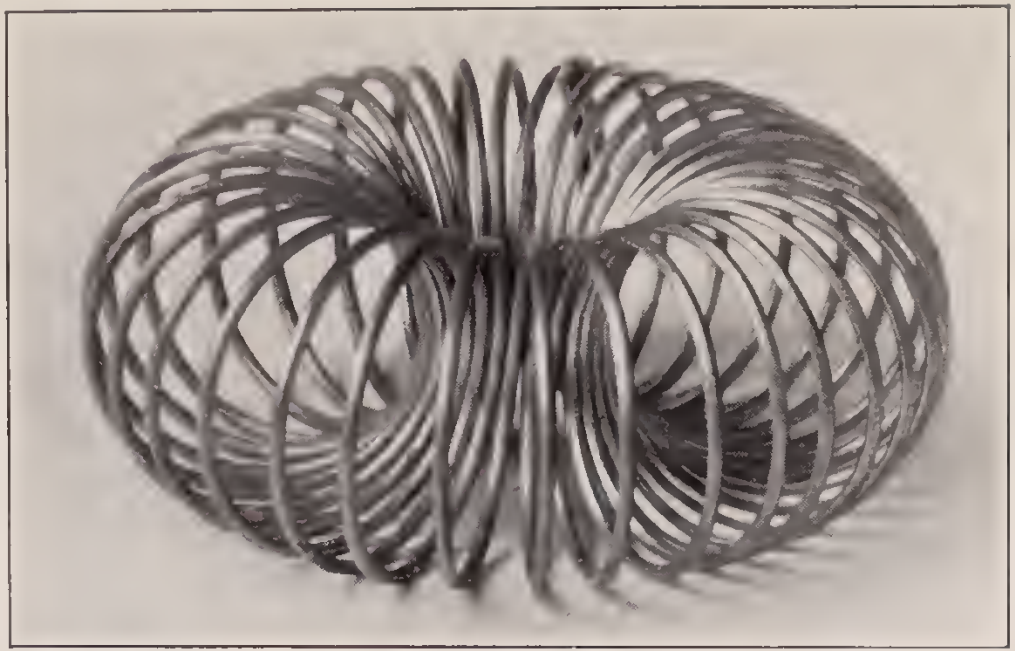
[46]Infinite, Chap. I. sec. IV. 2. 4. 5; Principia, part I. Chap. II. 20; Chap. III. 2. 6. 7. D. L. W. 300.

[47]Infinite, Chap. I. sec. IV. 4. 5. sec. V. 17. compared with sec. XI. 2. 3. and sec. XIV. 5.

[48]D. L. W. 154.

[49]Principia, part I. Chap. III. D. P. 6.

Plate II.



A Vortex Ring

Illustrating the perpetually spiral form and interior fluxion of finites.

Here the finite really begins. For the derivative corpuscles or substantials are concrete, but the component primitive points, or simples are not. Therefore *the latter are not to be called finite,* but *only the first of finiting,* or the intermediate, or nexus, between the Infinite and the finite, as was shown above.

These finest concrete substantials, or first finites, are only less perfect than the pure simples or primitives themselves, of which they are the first and only direct production. For while the primitives are "immediately Divine," the first finites or substantials are only mediately Divine through the primitives or simples.[50]

THE FIRST FINITES, or simplest concrete substantials, are bodies of a vortex ring form; each composed of great numbers of primitives bound together into a cohering aggregate corpuscle by their common circling motion.

These finites have an interior circulation coinciding with the reflective endeavor and activity of the primitives, which is actually produced by the flow of those primitives in them. From this interior circulation they have, all of them, a derivative endeavor and potency of local motion, of the same

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[50]Infinite, Chap. II. sec. I; Chap. I. last page.

general reflexive or perpetually circling type as the motion of the primitives. For with them also, "as is their interior circulation, so they do, so they move, so they act." But the diameter of this composite substantial is vastly larger, and its velocity of motion and momentum in collision, is greatly less than that of the primitives.

Thus originated the first substantial composites from the primitives of the Spiritual Sun, produced in a volume vast enough to fill the universe. And as it were instantly in and from their volume, by means of their own circling motions among each other, a myriad volume of second substantials was formed, swinging on towards the production of an aura or atmosphere or volume of bullæ, in which was attained the first equilibrated rest of creation.[51]

The Second Finite. The second substantials are related to the first, as the first to the primitives. And although they are of like generic form, interior circulation and derivative power of circling or orbital motion, these second finites are still larger, still more finited, move in still larger orbits, have less velocity of movement, and a weakened force of penetrative impact.

These are the second successives of accommoda-

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[51]Principia, part I. Chap. VI. 5.

tion and finiting, produced from the primitives of the Spiritual Sun. And the volumes of the first and second finites are the two radiant belts under the Spiritual Sun, above the angelic heaven.[52] The corresponding belts below the natural sun are the volumes of third and fourth finites, which are the primitives of the family of metals. The fifth finites are formed near the earth, and are able to exist only in the vicinage of earths.

THE FIRST AURA. Next in order after the first and second degrees of finiting, or the creation of volumes of first and second finites, follows the formation of the first atmosphere, or the first plane of the Divine as to Use,—the first and universal aura of the *Principia,* the *Infinite* and the *Economy,*—the first created volume of elastic bullular forms.

This is the third successive under the Spiritual Sun,[53] the third thing brought forth; the atmosphere at once of the celestial heaven, and of the whole universe; the particular atmosphere by which the Lord is present, as in firsts so in lasts; as within so without; as in heavens immediately so also immediately in all His world.[54] It is the first proceeding of the

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[52]A. C. 7270. H. H. 120.

[53]A. C. 7270.

[54]A. C. 7270. 7004. 3627. T. C. R. 63. 70. E. A. K. part I. 635; part II. 312. 339.

Lord, formed as use or atmosphere, going forth and filling both worlds, the spiritual and the natural, operating the effects of the ends of creation; for it is the supreme conjugial sphere.[55] In accordance with this we find that the human formative substance, the soul, the human internal, the human spirituous fluid, which receives the influx of the life of God, is formed from and in this aura.[56] And moreover this first aura describes a vortex and universe embracing and directing all other vortices or universes; and it is that supreme aura without which the minutest forms could not be held together in connection; nor could effects flow from their first causes, according to the order of nature.[57]

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[55]C. L. 386. T. C. R. 63. 70.

[56]E. A. K. part II. 168. 221. 228. 245.

[57]E. A. K. part II. 272, 312.

## CHAPTER II.

## THE DERIVATION OF THE FIRST SUBSTANCE OF CREATION.

A Resumé. We have already shown that the Infinite Esse is Substance in Itself, that it does not consist of a sum of bounded particles, that it is a purely continuous substance,[58] but that creation begins with myriads of minimal leasts finited in the Substance of the Infinite. These primal points are afterwards massed, concreted, arranged by God into forms or individua, and held together by Him. For to create is not only to cause to be, or to bring into existence, but afterwards to hold together.

The first finiting of Infinity, then, is the production of vortico-spiral rings of motion, small as points, in the substance of the Infinite; these are the primitives of the Spiritual Sun, and the seeds of the universe from which all creation is framed by God.

The only finiting in the substance of the Infinite, possible to take place without severance or infringement of the Substantial Unity of God, is a finiting by means of motion which delineates a boundary

[58] A. E. 1121.

and encloses and marks an area; and the simplest motion that can enclose and bound an area, is a circling motion. The ideal and fulness of a circling motion is the circulo-spiral, or perpetual vortical. In it are summed all possible circling motions of all degrees and types; and in it all the powers of Mechanics, both active and passive, exist in potency.

We have also observed that Love in God is a substance, and that the nature of all love is perpetually to return as in a circle to its source. Hence the activity of love as a substance flows into recircling lines; supremely so in the primitives and firsts of finiting, which embody, and are, the creative love of God in immediate outgo, activity, and gift. And all things framed and concreted thereof show feature of a like reflexing potency and activity.

It is from this ground, and no other, that all the atmospheres, which are four, successively formed, move by circling and recircling lines. At every touch they flow into such lines; nor can they move, act, or react, in any other way or path. The celestial atmosphere, or first aura, has this character essentially; and the others, though grosser in constitution, are not much behind it in their aptitude to run into vortices and circuits at every touch, stimulus, or strain acting upon them. It is their form of reaction.

In the organic world it is the same. It is from the same deep cause in the perpetually reflexing or circling motion in these seeds of creation, (supremely involving as they do the living ends of the created universe), that bloods arise and are established, and circulations run their rounds. The vegetative world also partakes in this gyre and power. And the mineral world has its emulation thereof. Even the dust of the ground is framed and compacted of the primitives of the Spiritual Sun. For there is no other substance given of which creation is formed. And the striving and tendency of these primitives of the Spiritual Sun, from which they are made, is in them, even in their far off concreteness.

We have also seen that the points or primitives of the Spiritual Sun are not inert, nor quiescent. And what they are in conatus, the like they are in act. They gyre about among themselves perpetually, in reflexing, recircling orbits, patterned after their inner endeavor. This circling and reflexing motion, pattern of their own interior conatus and flow, is the very thing, the very power and action, which carries the endeavor of creative love to farther ultimation, governs the form of that ultimation, acts in it as the spring of new and emulous endeavor, and serves as the efficient instrument of the orderly confluence and composition of the primitives into a

series of derivative finites or substantials of five grades or degrees.[59] But as they are produced in a series, they ever increase in size, with lessening velocity and penetrative force of impact; although the larger they are, the larger is the diameter of the vortical orbit they circle. By this series of derivative substantials the universe is successively finited more and more.

The First Atmosphere and its Uses in the Macrocosm and Microcosm. The third thing brought forth from the Spiritual Sun, is an atmosphere. This is the first atmosphere or aura, the third successive, received into the celestial heaven, and extended throughout the universe to the ultimates thereof.[60] For that which proceeds from the inmost extends everywhere.[61] This is the Divine proceeding from the Lord, which is called the sphere or atmosphere,[62] which fills both worlds, the spiritual and the natural, which operates the effects of those ends which the Lord predestined at creation, and for which He provides ever since the creation,—the very conjugial itself. For from this aura

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[59]Principia, part I. Chap. IV. 18. par. 2. 3. 4.

[60]A. C. 7270.

[61]A. C. 10188.

[62]C. L. 386.

and in it is generated the human soul, by which the Lord weaves the organic man.[63]

This first atmosphere, proximate to the Spiritual Sun, is of the very essence of that Sun.[64] It is the first aura of the *Principia* and the *Economy*, without which no effects could flow from their first causes according to order.[65] Generated from this first or universal aura, the human soul receives the life of God immediately; and in this is the ground of human immortality.[66] For the Lord enters with it, frames, sustains, and dwells within the human organism or individual forever.

This aura, then, is the plane and determinant of the soul, or human spirituous fluid, or human formative substance, which therefore derives from this aura, or first atmosphere of the universe, its own power of forming, by descent and derivation, all the degrees of the human form in mind and body.[67]

Moreover, as is the rank, use, and office of the formative substance in the microcosm, so is the rank, use, and office of the first aura in the macrocosm.[68]

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[63]Compare C. L. 204 and 183.
[64]D. L. W. 300.
[65]E. A. K. Part II. 272.
[66]E. A. K. part II. 245. 352. 168. 300. 350.
[67]E. A. K. part I. 635. 636.
[68]E. A. K. part II. 228. 221. 274. 276.

This first aura, third from the primitives of finition, from the Spiritual Sun, in one sole unique volume fills the extense of the universe.[69] It is the universal atmosphere by which the Lord is immediately present and immanent alike in the universe as He is in heaven; and acts alike upon and in the lasts of order, as upon and in the firsts; without which indeed there would be no sustentative ground in the universe for the Lord's immediate presence and operation in all things from first to last.[70]

As belonging to the human conjugial sphere, or being that sphere,[71] it is the very sphere of religion itself, and of the Church; and it is that universal sphere or atmosphere of the Divine as to use or operation, which fills all the natural world and all the spiritual world, and elevates all to heaven.[72] Being the most universal and most elevated of all, it is that by which all things are created, sustained, and held together, and which effects all arrangements into order. It is both creation and providence.[73] It is that primal plane of the Divine pro-

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[69]E. A. K. part II. 312. 339; Principia, part I. Chap. VI. 39. 50.

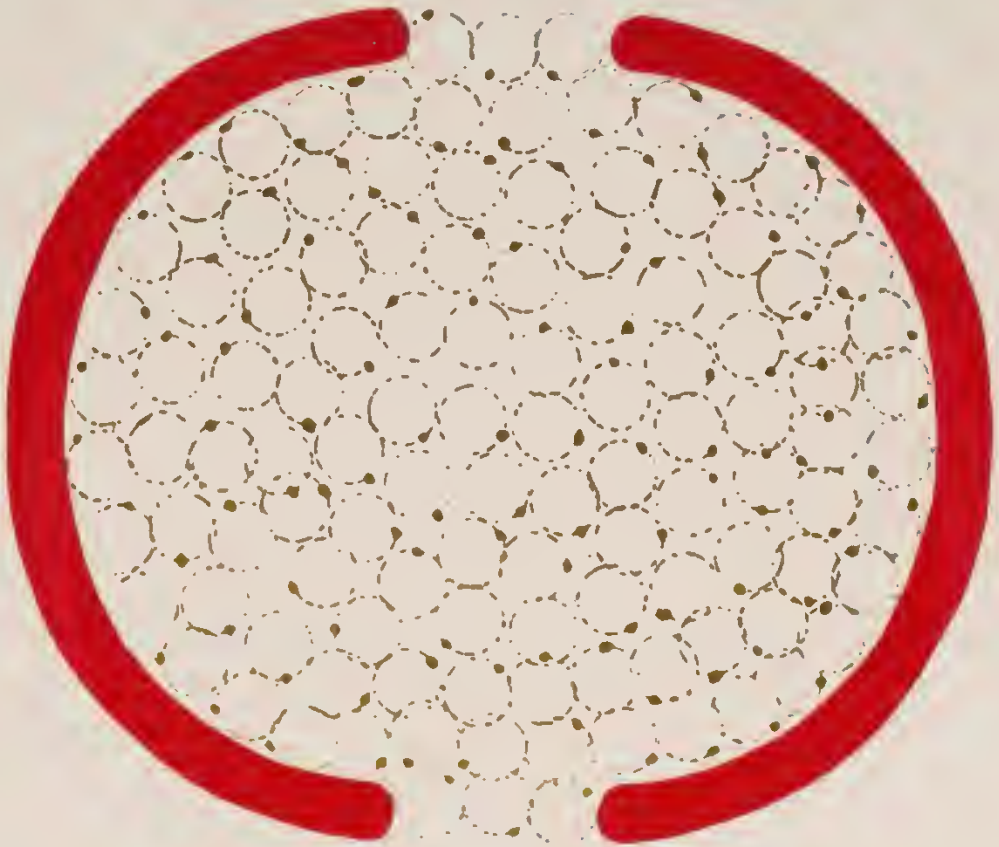
[70]A. C. 7270.

[71]C. L. 222-225, 386-397, 434 *et seq.*

[72]T. C. R. 652.

[73]A. C. 6483. 6482. 6338.

Plate III



A Bulla of the First Aura.

Vertical cross section; the red represents the envelope of second finites, the gold the active centre of first finites.

ceeding, formed as atmosphere, by which the heavens were created, and all the worlds of the universe.[74]

THE INTERNAL CONSTRUCTION OF THE FIRST AURA. The first aura is not in the nature of a third substantiate or finite, or a new, larger, more compounded vortex-ring corpuscle. It is a combination of the two grades of finites already in existence, the first and second. These two compounded make a finest bullular or foam-like form, very flexible, very elastic, constituting a volume or sphere, extended in the Infinite, vast enough to fill the universe.

The walls or envelopes of the particles or bullae of this aura are formed of the second grade of finites or substantials, set side by side, operating in long recircling lines. Within this envelope, certain uncombined first finites play in their free reflexive activity. They are called *the first actives*. These interior active spaces are the souls of the bullæ; the envelopes which encircle and finite the active spaces are the bodies of the bullæ.

This elastic bullular aura is the first form created that is able to transmit light, for it is the first form that is capable of elastic reciprocation. And the whole volume of this marvellous aura, in its whole

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[74]Ath. Cr. page 41; A. E. 726.

and in each bulla, is kept forever in the stream and rhythm of the life of God Man, and everywhere beats and pulsates with the cardiac motion of the Spiritual Sun.

These two things, the bullular structure and the perpetual expansion and contraction, characterize every atmosphere or aura, from the first to the last. All the planes of the Divine proceeding from the Spiritual Sun, formed successively into four auras, are bullular or foam-like structures; and all are kept in a rhythmic beating of alternate expansion and contraction. Although the bullae are successively larger, and the cardiac beating increasingly reluctant and slow in the descending series, yet all four of the auras are kept forever in the stream of such alternate expansion and contraction, or they would lose their pristine elementary or atmospheric character.[75] But this animatory motion is derived to each aura, or the bullae thereof, direct or indirect from its source in the Spiritual Sun. The one and universal volume of the first aura derives this motion from the Spiritual Sun immediately. The second aura derives it mediately through the natural sun; the third through the second aura, and the fourth through the third.

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[75]A. K. 392, note *a*.

In the first atmosphere, which, as we have said, is the third successive from the primitives of finiting, all these things are in their supreme, and as it were incomprehensible to the lower sensory and thought; so elevated and so active are they. [76] Yet we may conceive of it, by elevation of thought, as a marvellous pulsating aura, extended through the universe, spiritual and natural, in volume wide as creative thought and operation, brought forth in the Infinite Esse of God; everywhere throbbing, and in all its bullae beating in and out, in rhythm with the Spiritual Sun, where the cardiac and pulmonic motion of the Divine acts perpetually. It is from this wondrous protoplasm of the universe, this living plasm, this homo-plasm, that we are given to understand that the created universe is organic.[77] And, as we have already seen, the origin of the human organic form is in this universal aura, and the human spirituous fluid, the human formative substance, is generated from it, even in all men on every earth.

THIS HUMAN SPIRITUOUS FLUID, the human internal, is not a mind, it is not a body; *it is a blood,* supremely fluent, a sublime essence, the life itself of man. It is not our own, although it forms, builds, makes us men, and holds us individual and

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[76] E. A. K. Part I. 635; part II. 312; De Fibra. 290.

[77] S. D. 3576. 3577.

one. It is wise for us, elevates, sustains, and strives. It is the Lord with us, since it lives the life of God, and not our own.[78] By it the Lord is immediately present with and in man, whether he be in heaven or hell; though the man live at one side of the universe or the other, be bodied upon our little earth, or on an earth in the remotest bound of the universe. In it all who are human, all in the universe, are one. For the aura which generates it is one and universal, and looks and acts to one universal end.[79] It is as wise in the unborn babe as in the sage.[80] Though suns and solar systems be dispersed, it would remain unharmed, as the aura that gave it birth.[81] It flows as life and light into every plane of our minds, having all the wisdom of creation connate in it, the abundance of which shall be ours, so soon as we present the cups meet to be filled with such wine.[82] And it flows into the whole body, also, and all the viscera, with instant and immediate providence.

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[78]S. D. 2829. 2835. 2836. E. A. K. part I. 311, part II 238, 390.

[79]E. A. K. part II. 294; T. C. R. 366.

[80]E. A. K. part II, 294; The Soul, 134; T. C. R. 166-169

[81]Adv. 919. E. A. K. part II. 350.

[82]E. A. K. part II. 290. 292. 293. 296-298; T. C. R. 154. 366; S. D. 4016.

Such are the qualities, the predicates, the rank, the office, of the human spirituous fluid or soul, as given in the *Economy,* the *Animal Kingdom,* and the *Principia.* Such in the succession from the Infinite is the rank, office, and predication of the primal aura in the scheme of God's creation of the universe.

This human spirituous fluid, in its circling outgo and return, outlines all the vessels and structures of the four degrees of human faculties.[83] It is not a brain, nor a fibre, tissue or membranous structure, or a mind, but it is verily a fluid, a blood, and thus Swedenborg calls it an essence. It is above imagination. It partakes of Life. It is far above the "anatomical sphere." It is the motive and determinant principle, the life and essence of all our human form.[84] Swedenborg says, "words fail us to express what it is, for words are taken from a lower sphere." Still we must use words; and the use of the term fluid or blood marks a necessary distinction, since we know the distinction between a fluid and its vessel, or between blood and tissue, between the content and the containant.

THE SIMPLE FIBRE. This flowing human in-

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[83]E. A. K. part II. 283. 284. 289. 291. 292.

[84]The Soul, 159; De Fibra, 249, 252, 269; E. A. K. part II. 311.

ternal, however, this human spirituous fluid and soul, is not the whole organic stake which the human form possesses in the first aura. From a portion of the substance of its own flowing stream, compressed, condensed, it forms as it were the analogue of a tunic or vessel, to clothe and garment its streaming substance. It gives a portion of its own self substance to be used to frame a reflexing containant vessel, which becomes something like a membrane.[85] This tunic is sensitive, alive, wonderful,[86] and is as to substance a compressed and compacted form of that supreme fluid, which "is perfectly alive in all its singulars or individual parts.[87]

This is the most eminent fibril or tunic, wonderful beyond measure or imagination, which transmits the human formative substance, the human spirituous fluid; and from which all other forms and substances of the human organism, sensitive or motor, receive the form of their existence.[88]

THE CELESTIAL CORTEX. The first determination or use, which the human internal or soul makes of this fibril, is to weave therewith the sensitive and motor organism of a plane of supereminent faculty;

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[85]E. A. K. part II. 296. 297.
[86]De Fibra, 250, *et seq.*
[87]E. A. K. part II. 352.
[88]De Fibra, 249-256.

an organic structure and faculty of celestial mind and life; to become its own immediate consort on the plane of the first aura,—a sort of celestial cortex, as it were, a simple full celestial brain, to act as its own proximate correspondent, its own form and body.[89]

This is the human faculty, the supra-mental faculty, the celestial, which the human soul forms first,—the celestial cortex founded in the first aura as the eye is founded in the ether, or the ear is founded in the air, as the universal human is founded in God. And because this is the first form of the human, which the Lord creates after the very soul itself, without which no other human organic is determined, no cortical glands, no fibres, nor weaving body,[90] therefore, this inmost or celestial cortex may be called the first organic, or membranous human plane, where finite bounded man first begins to be man, existent, objectized, recipient. This also is given in the father's seed.[91]

Since this celestial faculty, this inmost human cortex, exists in all human beings in the universe,

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[89]The Soul, 127. 128. 166.

[90]The Soul, 134. 126.

[91]Posthumous Tracts: Origin and Propagation of the Soul, Chap. II.

the way to it may be opened,[92] and man may live the celestial life, or belong to the celestial heaven. And as the first aura, in which the life of this cortex is founded, is one and universal for all earths and solar systems of the created universe, so all men from all earths, in whom this degree of the human organism is opened, dwell in one common heaven.[93]

This simple cortex, or simple cortical substance is the truly celestial form.[94] It is the simplest, purest, most eminent of all the organs, and at the same time the supreme sensitive and compositive of the human form.[95] It is, as a faculty, as wise in the embryo as in the adult and the sage.[96]

In all the operations of the cerebellum, and in the cerebrum itself during sleep, every force begins in the simple cortex, the celestial organic, or pure intellect. A defect alone of instrumental causes, or intermediates, hinders its full act in the cerebrum, during waking hours.[97] It cannot be instructed from below or from the outside, for it is already full of

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[92]The Soul, 155.
[93]A. C. 6701, 7078.
[94]The Soul, 135; De Fibra, 251-254. 279.
[95]The Soul, 126.
[96]The Soul, 134. 155.
[97]The Soul, 171, 132.

the arcana of nature and the created universe.[98] It presents already simultaneously in itself, all that the middle mind, or the rational, will ever attain to successively.[99] It is called the pure intellectory or intellect,[100] which mediates between the soul itself, and the mind, or understanding, the rational.[101]

It would seem therefore to be that intellectual referred to in *A. C.* 1495, where the warning is given not to proceed from scientific and rational truths to the celestial, without intellectual truths as media.

This celestial or super-rational form and cortex, then, is that most holy place and degree, in man, viewed as a little tabernacle for the Divine, where the ark of the covenant of life abides; and God alone is the light thereof.

The soul builds this plane answerable to the primal aura; but there are four successive atmospheres, or auras, which are as it were the four apartments of the Divine Proceeding, as the Tabernacle in the universe, where God appoints to meet with man. To these four atmospheres are formed, or in them are founded, as many successive fibrous

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[98]The Soul, 134. 166.

[99]The Soul, 131, 132.

[100]The Soul, 125, 166, 171.

[101]The Soul, 136.

or membranous planes in man, the celestial, the rational or intermediate mind, the natural sensory and the physical itself. But the full consideration of these must be reserved for a future occasion; and so let us return to the general subject of the auras themselves.

THE SECOND AURA. The first aura is one and in one volume throughout the universal creation, spiritual and natural; but the second aura is not brought forth as one volume, but as many. For there are as many volumes of second aura as there are starry suns in the created universe.

For this reason the celestial heaven, which is founded in the first and universal atmosphere of creation, is one heaven. But the spiritual heaven, which is founded in the second aura, is not one but many; it consists of as many heavenly societies, or heavens, as are the number of the starry suns of creation;[102] each society or heaven thereof being founded in a specific volume and vortex of second aura, generated by and around its own star or sun. Thus as the first aura is answerable to the highest or inmost place of the tabernacle where God is the sufficient light thereof, the second aura may stand as the holy place, the second room of the tabernacle

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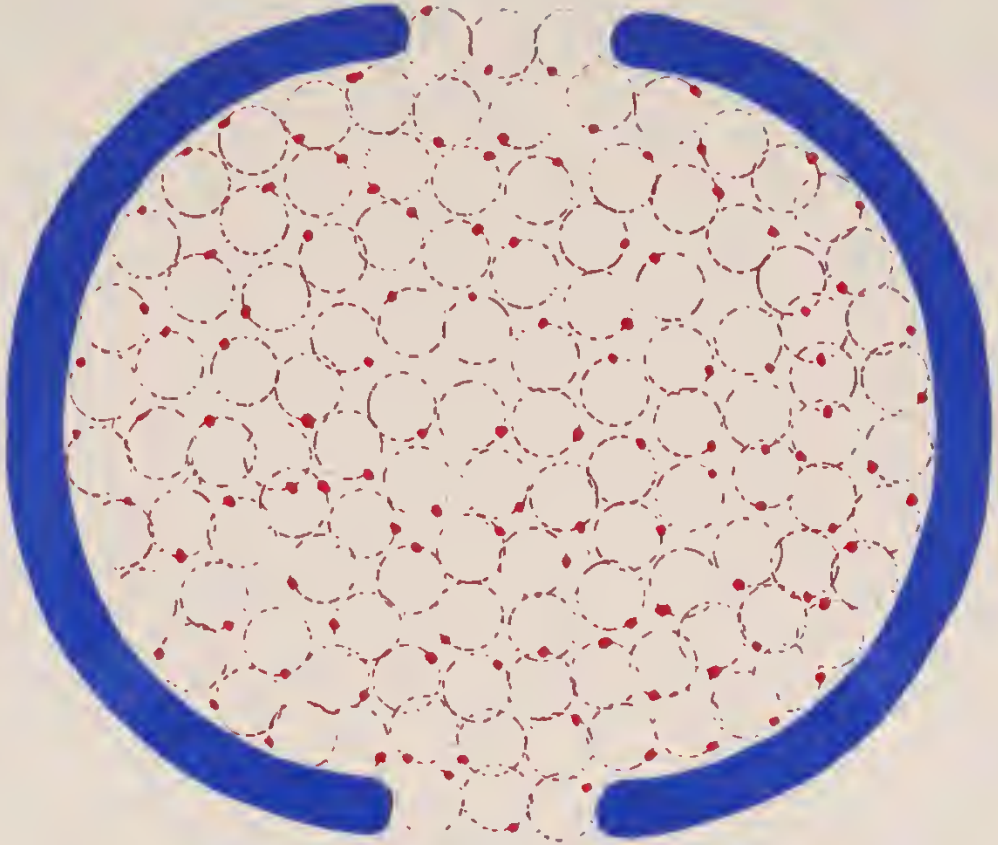
[102] T. C. R. 160.

Plate IV.



A Bulla of the Second Aura.

Vertical cross section: the blue represents the envelope of third finites, the red the active centre of second finites.

heavens, where the candles of the stars give light.

THE BULLÆ OF THE SECOND OR MAGNETIC AURA are larger than those of the first, and cannot be kept in their palpitant motion by the finer action of the Spiritual Sun directly or without a medium. The bullæ are not only larger, but at the same time stiffer and slower in elastic expansion and contraction; they are of less velocity and aptitude to motion, and their circling orbits are of a lower type. The living cardiac motions of the Spiritual Sun are too rapid, too subtle, too fine, to set the stiffer, larger bullæ of the second aura into consonant pulsatile motion. But they can be maintained in their rhythmic expansion and contraction by the animatory motion of the Spiritual Sun, acting as a large centre or soul, in and by the medium of the *gross radiant envelope of primitive metallic substantials and fourth finites,* which form the encrusting body of *a star or sun,* such as we behold it with our natural eyes.

For natural suns as we see them are double suns. The Spiritual Sun is their centre and soul, the very active central space within; and fiery least metallic substantials are their body. The two act as one sun. From this origin all things are double. As men we live in a double world, the spiritual and the natural; we are double men, having a soul and

a body. All things that exist in the world of effects are double things, having as it were a soul and a body, or a spiritual cause and a natural effect, or a spiritual active center and a natural envelope or body, which act together as one cause. It is thus that the law of correspondence arises.

Moreover, the first and second successive, constituting the two radiant belts below the Spiritual Sun, do not afford materials sufficing for the stiffer envelopes of the larger bullæ of the second aura. For them some substantials or finites, more highly compounded still, are requisite; some new finites of larger mass, lowered velocity, and widened circle of motion.* These are *the third finites,* formed by compression and composition of the particles or bullæ of the first aura; which together with the fourth finites form the mass of the natural sun as seen by our eyes, that is, the mass of the fiery me-

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*Compression as an agent or engine in the concretion of substance begins only with the production of the *third* substantiates or finites. With the first and second grades of finites, compression does not enter as a cause of formation. Their only agent of formation or composition, their only bond of connection, is the motion of their component particles or vortex-points in like circular orbits. This is the only tie that holds them together. (Principia. Part I. chap. III. 12.)

tallic shell or envelope around the active centre of the Spiritual Sun within.

THE ACCOMMODATION OF THE SPIRITUAL SUN. In order that the Spiritual Sun might form the second degree or atmosphere, that in which the spiritual heaven is founded, it was necessary for that Sun to accommodate and instrument itself about with a certain dense envelope or body. It is this accommodation and embodiment of the Spiritual Sun which appears in the natural world as a sun or star. For the spiritual or soul is always first and takes to itself a body, that it may do uses. The natural sun thus lies around and encloses the active spiritual centre, as the shell of a nut around its living kernel.

But the greater the accommodation, the more narrowed the range of outgoing action. Hence the Spiritual Sun, acting into and from a sun or star, as an enveloping body, does not extend its influence far. Hence many natural suns are required in the universe to develop volumes of second aura. There are thus as many volumes of second atmospheres or aura, as the number of the stars in the sky; each volume being developed about its parent star, and localized about it for its very maintenance; and each volume of the second aura, as we have said, is the ground and habitat of one society of the spiritual

heaven, that is, the angels of the spiritual heaven dwell interiorly of the expanse of the second aura. For "although the expanse around the Sun of the angelic heaven is not an extense, still it is *in* the extense of the natural sun, and with the subjects there according to their form."[103]

THE VOLUMES OF THE SECOND AURA. It is further apparent, that, as no two suns are precisely alike, as star differs from star in glory, the volumes of second aura differ likewise. Great volumes belong to great stars, small volumes to small ones; and modifications as to form extend even to the bullæ thereof. And such a difference is the basis of a special individuation of genius and type in the society of the heavens founded therein. That no two worlds or systems are precisely the same, as to atmospheres, earths, or forms arising out of them, see the *Divine Love and Wisdom,* n. 318.

Now as this second aura differs somewhat in every solar system of the created universe, it is evident that the correlated plane in man, the intermediate human, the rational, is framed in and to the second aura of the individual solar system, upon one of whose earths he is brought forth, grows, and is educated; and that all the form and genius,—in-

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[103]C. L. 380.

dividual and social,—of that solar system, with all its peculiar features, will be stamped upon him.[104] The result would be so markedly different, that men of two solar systems could scarcely understand each other.[105] And it is evident that, after death, a man who goes only to the spiritual heaven, which is founded in this second aura, will remain in relation with the volume of the second aura around that particular sun, under whose rays he was born. For only there do those live who are of like genius with himself; and only in the range and sphere of that particular vortex can he abide, and be free and at home.

For the units of the gray or cortical glandular forms of the human organic mind are built to the size of the bullæ of the second aura, and natively expand and contract in sympathetic rhythm and consonance therewith; that is, they expand and contract with the animatory pulsation of the natural sun of their own solar system.

Herein follows a marvel! Even as the myriads of cortical glandules in the microcosmic man, so in the Grand Man is the number, the order, the situation, and relation of the societies of the spiritual

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[104]Principia, part I. Chap. I. 12.

[105]Principia, part III. Chap. II. 4.

heaven; and the same is the number, the order, the connection of the starry suns of creation, and their vortices about them. Hence the order and situation of the suns and their solar systems in the universe, are as the order and situation of the cortical glandules which form in their complex the intermediate and proper faculty of man.[106] Therefore it is that the Lord from creation, foreseeing the number of such units of the second order or degree, which would be necessary to fill the human form of that degree, provided even from the first of creation for as many suns or stars.[107]

These innumerable starry suns with their vortices are linked each with each in a stupendous order and form, connecting throughout the universe. And Swedenborg says that no change can happen in one which is not perceived in all the others.[108] Nor is the form ever full and closed. Stars as yet latent may blaze forth. Ever new forms, new heavens and new earths, may arise carrying the human creation to fuller and more varied perfection without end.

Discrete Degrees. The history of the formation of the volumes of second aura instructs us as to the

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[106]S. D. 270. A. C. 4039-4041. D. L. W. 366.

[107]T. C. R. 160.

[108]Principia, part III. Chap. I. 9. 11.

formation of discrete degrees. Every created thing is finite, and in the progress of creation one thing was formed from another. Thence were made degrees.[109]

The *Economy* notes that an understanding of degrees is basic to the knowledge and recognition of correspondence;[110] and we learn therefrom how derivative forms are concreted, formed, and maintained, from the substance of a plane, older, finer, more fluid, and more active, and at the same time more universal, more all-embracing, than the derivative, posterior, more compounded, and more ultimate degrees.[111] Also how these new and more finited forms, although consubstantiate with the higher and prior plane, shall be in quality and determination so distinct from that prior, that they deserve to receive a new and distinct name,[112] and become a substance that exists as it were by itself. The doctrine of degrees then exhibits the very ladder of universal creation;[113] and the understanding of it teaches the very nature of order in the actual successions and subordinations of creation.

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[109]T. C. R. 33.
[110]E. A. K. part II. 281.
[111]E. A. K., part I. 614-617.
[112]E. A. K., part I. 579; part II. 281.
[113]E. A. K., part II. 210.

"We rarely entertain a distinct idea of degrees."[114]

We think of discrete degrees as if they were something that existed eternally. But according to Swedenborg degrees are finite things, and have come about by finiting processes and definite laws. They were made, and can be conceived as unmade. In the organic world discrete degrees are actually at every instant made and unmade, compounded and resolved. At every round of the transcendent circulation of the three-fold human blood, there is a perpetual descent and ascent according to degrees, and this most distinctly and discretely.[115]

Moreover, the history of the rise, succession, and the correspondential relations of the four auras or atmospheres of the universe, is the making of the great elemental series of four degrees, distinct, discrete, extended in the universe as the tabernacle of the heavens with its four distinct apartments.

Now when a posterior or more finited degree is to be brought into existence, the substance of the prior degree, by means of flowing currents in its volume, outlines and delineates the form, or faculty, about to be created. This representation of the yet unborn posterior in the prior, extends, Swedenborg

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[114]E. A. K., part II. 205.

[115]A. K. 260. s.; E. A. K., part I. 148-154. 161. 199. 602; part II. 222.

says, as a cause to all causates, both in the kingdom of the auras, and in the animal body.[116] And after the posterior is constructed as an individual form or plane, the flowing currents of the prior, which delineated the posterior or secondary form, still hold the second form together, and maintain it perpetually.

The lines of the pattern, thus primarily represented in the prior substance, are afterwards as it were infilled with entia, bullæ, particles, or finites, proper to the degree of the plane to be produced, having been first formed from the prior degree by composition and compression. These myriads of infilling particles are then held together in the flowing matrix of the superior plane which surrounds and encompasses them.

Whatever be the potency of the units or substantiates in themselves, so soon as they enter with others into the construction of a more finited and concrete form, their active potency is finited to the general choral march or gyre of the form of which they are now part and parcel. There remains in the substance but the effort and the intuitive instinct to endeavor back again, to ascend again to the source from which it set forth; and thus operate an inner en-

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[116]E. A. K., part II. 276.

deavor to resolve the form of which it is part, and ascend even by the death of that form to its own purer and higher degrees; especially if the ultimate form becomes non-correspondent to the ends of creation, to the reception of the Divine, and co-operation in the service of its uses. It seems to have been from this action of the Divine endeavor in ultimates, that the antediluvian race was corporeally destroyed at the time of the flood.[117]

It is, indeed, a common law of spiritual compound form, that whatever may be the power of action of the primal units or substantials in themselves, in their own prior plane, whenever they unite together to frame compound forms of a lower character and degree, their action is then limited and defined to the form and plane of which they now make a part; there remaining only a conatus to resolve and ascend to the higher degree.

A celestial man loses his wisdom when he descends to a lower plane; and the human spirituous fluid,—in which resides *per se* a range of knowledge and of action commensurate with creation,—when its substance is mated with etherial and aerial salts and compounded into the red blood, lives but

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[117]Ath. Cr. p. 15.

a common and obscure life.[118] In it, during the stage of its composition as red blood, there remains only the endeavor towards resolution through the walls of the capillaries,—the endeavor towards the death of its composite form, by the laying down of the inert copulating salts, and thereby its own freeing, separation, resolution, ascent and return to its pristine activity and life.

Indeed, the death of the outer body as a whole, and at the same time the resurrection to higher planes of knowledge and life, is but a laying down at once *en masse,* of all the salts and inert particles in the blood, and from the blood in the tissues. By that death the human spirituous fluid ascends and returns to its own full human life together with the simplest fibre which is released with it, in all its complex of organism,—the latter being conditioned according to the modification of its form, stamped by the habit of individual mental life,—and carrying with it such and so much of the subtle spheres, given off by lower organic planes of the mind and their activities, as have contributed to its own opening and infilling.

The story of the formation, then, of a human organism at birth, by successive compositions of the

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[118]Post. Tracts, The Red Blood, Chap. XIV.

spirituous fluid or human internal, and the re-ascent at death, is exactly the story of the circle of descent by discrete degrees of compounding, and ascent by degrees of death or lying down or resolution, which is repeated momentarily in the course of the transcendent circulation of human internal to ultimate effect, form, and use, and back again to its origin and source.[119]

The *Principia* instructs us therefore as to the true mode and manner of the formation of discrete degrees, in the story of the successive formation of finites from their first origin in the Spiritual Sun, by successive stages of composition even to the ultimates of nature. The Writings repeat the same story in general, summing together the details that are given in the *Principia*.[120]

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[119]E. A. K., part I. 158. 161. 199; A. K. 407. note s.

[120]See T. C. R. 33. 76; D. L. W. 94. 302-305. 310.

## CHAPTER III.

## NATURAL SUNS AND PLANETS.

Natural Suns have an internal, or soul, and a natural envelope or body; and their internal is the beginning, their bodies being an accretion added later. After they have been brought into their full and ultimate form, the two act as one cause on the plane of effects, as the soul and body of man.

The internal of natural suns is a pure active space of the Spiritual Sun, together with the first active proceedings or radiant belts from it. This internal exists primitively as a vast and apparently vacuous abyss, but a spherical abyss of living force, surrounded by the foam structure of the universal aura.

This vast sun-internal or star soul is in a perpetual animatory motion,[121] a most eminent cardiac and pulmonic motion which God Man acts from Himself into the forms of universal creation.[122] Therefore, the origin of this motion is living, su-

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[121]E. A. K., part I. 170. 300; II. 312.

[122]D. L. W. 392: E. A. K., part I. 169. 170. 300. 302. 314; D. Wis. XII, 3, 5.

premely living, since it is from the life and action immediately from God Man Himself.[123]

In this internal are the seeds of suns and solar systems, and the volume of the universal aura is as the common mother by which all suns and worlds are produced. Thus the enveloping body of suns is taken from the matrix or mother.[124]. This body presents itself in the shape of a sort of double radiant envelope, composed of volumes of third and fourth finites.[125] These latter are the primitives of the finer and grosser members of the metallic family in nature.[126]

When the internal or Spiritual Sun has at length formed such a body about itself, it thereafter acts its animatory motion into its own enveloping body; and that envelope, receiving this animatory motion, in turn acts from itself a derivative animatory motion;[127] even as we are taught that an internal or soul always acts into and upon its body, and the body then acts from itself.[128] This derivative animatory motion is of a slower rhythm, more bounded

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[123]D L. W. 157. 392. T. C. R. 472.

[124]D. Wis. III. 2; T. C. R. 92.

[125]Principia, part I. Chap. VIII; part III. Chap. III.

[126]Corpuscular Philosophy.

[127]E. A. K. part I. 170; D. L. W. 157. 392.

[128]T. C. R. 154.

and finited, and of far greater breadth of difference between expansion and constriction. Thus it is able to act upon and affect large, gross, less elastic bullæ, and to reduce the more non-living forms into sympathetic reciprocations and expansions, such as the fine animations of the pure spiritual centre or Spiritual Sun itself cannot do;[129] even as a nerve cannot act upon a stone immediately, but only by means of its grosser body or instrument, a muscle.

Suns are thus bodied about with an envelope of something like a flamy metallic vapor, the splendor of which we see as fire. This flamy fire in its substantiates is the very beginning of what we may call the natural. The third and fourth finites which constitute it are in a primal freedom of activity beyond earthly comparison. But as a whole this envelope is under an equilibrium of pressure from the activity of the Spiritual Sun within and the reacting aura without which condenses, presses, and steadies it, almost into a viscous mass. This is where metallic primitives have their rise and origin, and what Swedenborg teaches of the primitive metallic nature of the fiery envelope of the sun has been observed by the spectrum.

First and second substantials, the finites which

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[129]T. C. R. 308; D. Wis. XII. 2. 3. 5.

constitute the two radiant belts below the Spiritual Sun, are framed immediately from the primitives of that Sun, by means of their own conflowing and conglobation. They arise directly from the Spiritual Sun, belong to the whole universe, and are framed into the bullular structure of the universal aura. The latter is thus of the very essence of the Spiritual Sun.[130]

THIRD AND FOURTH SUBSTANTIALS OR FINITES are formed in the immediate vicinage of suns, just on the border between their active souls or centers and the surrounding volumes of first and second auras; and they are formed by condensations and compressions of the foam-texture of these auras. The volume of third and fourth finites, thus formed about a given sun, belongs not to the universe, but to one particular solar system, and serves for its individual uses and materia. Fifth finites, however, come into existence only around the individual planetary masses.[131] Each local volume of fifth finites, therefore, is confined near the surface of its own parent planet, and is appropriate to the uses and grosser materia of that particular planet.

FIFTH FINITES are the active primitives or pro-

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[130]D. L. W. 300.

[131]Principia, part III. Chap. VI.

genitors of the sixth and seventh families of the periodic system of chemical elements, that is, the oxygen-sulphur and halogen families; for Swedenborg says that the fifth finites are the elementary primitives of our earthly or culinary fire,[132] and that they enter chiefly into those angular acid salts, derived by the functional activity of the vegetable kingdom into the interstices of the bullæ of the fourth elementaries;[133] and by which the venous blood is changed into arterial in the lungs.[134] This volatile aerial salt, floating in the bullular interstices of the aerial elementary, is derived from the soil into the interstices of the aerial elementary, through free vegetative activity by means of the current of vaporous exhalation from the leaves.[135] These finites are also the primitives composing one of the two substances entering into the structure of the water unit,[136] and are also the primitives which enter into one of the two constituents of the sea or halogen salts.[137]

Since the fifth finites originated strictly at the sur-

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[132]Principia, part III. Chap. VIII.

[133]T. C. R. 470; Corp. Phil.; De Fibra, 273.

[134]A. K. 406, 407, 485, 488. E. A. K., part I. 50.

[135]D. L. W. 310. 420; Doc. 302. On Odours; Principia, part III. Chap. IX. 4.

[136]Principia, part III. Chap. IX. 1; Chap. III. I.

[137]Principles of Chemistry, Chap. I. and X.

face of the planets, and began to be formed there only when the planets were at a great distance from the sun, none of the derivatives of the fifth finites can be formed in the enveloping body of the sun. This fact, viz., that the primitives of the sixth and seventh periodic families of chemistry exist in the vicinage of the planets, and not in the envelope of the sun, has been independently discovered within the last generation by the aid of the spectroscope. The reason why the sun is without these elements so common upon the earth, on any supposition that the earth mass was itself part of the common belt of the sun, is one of the puzzles of modern research. Swedenborg gives the clue to its cause, in his teaching as to the origin of the primitives of the metallic families immediately about the solar center, and the origin of the larger, grosser primitive substantiates, as those of the oxygen-sulphur and halogen families, about the planets.

Origin of the Third Finites. The third finites, which form the envelopes of the bullæ of the second aura, are prepared by compression from the primal aura. The compression of the bullæ of the first aura is effected at the expense of their active centers. The first finites, active in these nuclear centers, escape, leaving the empty envelopes of second finites, which by compression then form the third

finites, ready to be used to form the crust or envelope of the particle of the second aura.

The first substantials or finites, which form the active center of the primal aura particle, and which escape on the compression of this particle, are for the most part eventually compounded or brought together to form second substantials active, and very many of them enter the internal active space of a sun.[138] For second and first substantials can move without mutual interference in the same field, if the space is not confined.[139]

The third grade of finites or substantials thus come into existence by compression of the foam substance of the primal aura. They are the first of the finites to be formed by the instrumentality of compression. They possess the same vortex ring figure as the first and second. They have the like vortico-spiral internal circulation, and the like conatus and potency of spontaneous activity and orbital motion; but of a lessened velocity and a wider orbit. Their interior texture is relatively coarse and comparatively open.[140]

These third finites are produced in innumerable volumes about the primitive internal of a solar cen-

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[138]Principia, part I. Chap.VI. 8.

[139]Principia, Part I. Chap. VII. 8. 9.

[140]Principia, part I. Chap. VII. 7.

ter. Of them is formed the enveloping body of a sun. They always remain in the envelope as a part of it. They never enter the internal space of higher power. Their entrance is guarded against by the very coarseness of their texture. They are a discrete degree below, and, as we have seen, *Nature properly begins with them.*

The Bullæ of the Second Aura. And now new bullæ are formed with active centers similar to the active center of the sun itself, and with a similar circumference or envelope,—first and second finites active forming the active center or soul of these bullæ, while third finites passive form their bounding envelopes. These are the bullæ of the second aura. Their very endeavor and motion is vortical; they are carried out from the sun along the streaming vortex gyre of the primal aura; and they are produced in such abundance that they at length form a volume of as great breadth as the breadth of the solar system which is then to be. This volume of the second or magnetic aura is itself in the shape of a vast vortex ring, lying all about the sun, and of which that sun is the center, a volume revolving in rotary wheel and gyre forever.[141] This is the great circumambient atmosphere of the

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[141]Principia, part III. Chap. I. part I. Chap. X. 5. 6. 7.

sun, constituting its own aura and vortex, the second aura, the first of the natural.

Fourth Finites. From the bullæ of this grosser aura, the second, in turn and after a like fashion, condensations are formed in the immediate vicinage of the sun; for the law by which creation descends by successive degrees of compression and composition, continues its operation. The result is finites of the next degree, or fourth finites.[142] Of these finites an enormous passive volume was formed about the sun in the epoch of the primal birth of the system. This chaotic volume of fourth finites at that period was increased and concreted until it formed a dense darkening crust around the sun, of incredible thickness and resistance.[143] Still it was whirled and rotated about the sun, by the general wheeling motion of the vortex of the second aura of which it is practically a part.[144] And this perpetual rotating motion continued, until the centrifugal whirl of the vast stiffening shell resulted in its disruption. Then were formed three kinds of astronomical bodies.[145]

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[142]Principia, part I. Chap. IX. 10; Part III. Chap. IV 1. 3.

[143]Principia, Part III. Chap. IV. 2. 3. 4.

[144]Principia, part III. Chap. IV. 5. 6. 7.

[145]Principia, *ibid* 7, *et seq.* (fig. 103.)

1. Where masses of the envelope were rounded into simple balls, the solid planets were formed.

2. Where the *outer* side of the envelope curled over outwards, and conglobated like a thick envelope round a sort of nucleus of the aura of the vortex, the non-solid fluctuant satellites came into existence.

3. Where the *inner* passive dense crust was driven outward by the expansive force of the active center, the edges of its broken fragments curled over and globed about masses of the inner solar space, forming great expansile bullæ like pseudo suns. These are the vast solar bubbles or sun spots, sure to burst as soon as the outside pressure lessens.

Sufficiently immense for this threefold use was the primal mass of the first bodiment of the sun. In the epoch after the formation and breaking up of the first dense envelope, the body of the sun was formed again for its age-long uses. And again the epochal story of the period of compression and disruption is rhythmically told in tensions and releases of twelve year periods. But never again does the solar envelope grow so thick and stiff that it ceases to vibrate, and darkens the sun; nor ever again does it attain to anything like the thickness adequate to the making of planetary masses. Only at periods is the surface tossed; magnetic storms of irregular current

stream in the vortex; and the new sun-spots, taking birth and origin on the inner side of the envelope, make their way through, until, as they touch a less dense region, they break, like the vast bubbles they are; and toss their films of metallic fire into the plane of the vortex volume about the sun's equator, there to add their quota to the meteoric dust, shining in that far region like moths in a sunbeam; and in the long ages giving rise to the lens-shaped ray of that serene fairy illumination we call the zodiacal light.

The Planetary Masses. First in importance are the planetary masses or primitive earths. These are spherical masses of the materia of the solar crust, the fourth substantials, and can be formed only where the ring of that materia is thickest. They are homogeneous all through. They have no rarefied elastic central space, but are as solid as anything can be, and, if anything, are more compressed at their core than at their surface.[146]

These resistant solid globes, though spherical, are yet flattened at their poles, the reasons for which we may here briefly consider.

Since primitive earths are made of substantials or finites; since finites of every grade have a vortex-

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[146]Principia, part III. Chap. III, 7 *et seq.*

ring configuration, and a conatus to circulo-spiral motion; since finites of such figure can be more closely packed when they are set in orderly arrangement, flattened pole to flattened pole; since this is the arrangement into which they bring themselves when greatly crowded and in sufficient volume; since around the starry suns the vast masses of fourth finites find themselves under the required conditions of mutual pressure; and since the finites composing these immense globular masses will arrange themselves in such *roulcaux,* pole to pole; therefore, the result will be a vast ball emulating the flattened discoid shape of the constituent finites. The primitive earth mass thus became as it were a huge image of the finites entering into its composition.[147] And it is worthy to be noted as remarkable, that the close set *roulcaux* of finites, though compacted into such a mass, yet carry on a slow oppressed circulation, from an inherent conatus to it which is retained even in the dark moveless condensation of its core. By virtue of this fact, the great globes as a whole have in them a striving to an orbital motion of their own, emulous of the circulo-spiral orbit in which the finites themselves run.

The single finites possess native orbits of small

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[147] Principia, part III. Chap. XI. 2. 3.

diameters, inconceivably small. But the earth mass images of finites have native orbits of millions of miles; the orbit being proportioned to the size of the body. Therefore, the great earth masses, solid, resistant all through, are yet emulous finites or substantials, and have in themselves the conatus and power of running forever in an orbital circulospiral path.

If such bodies pass from the vicinage of the sun, outwards along the lines of its revolving vortex, to a situation where the pressures of the surrounding ether-foam are less, to a situation where the aura around them is more rarefied than near the sun, no abrupt or disastrous consequences can befall them. For instance, they cannot explode, since this does not happen to solid bodies. The only thing that can happen to them, on coming to a region of less density, is that the layers of finites on their immediate surface will tend to free themselves, and, in clouds like vapor from the water, will rise, circle, and curl about the solid surface of the planets.

The part which these freed streams of fourth finites play will be taken up in the later study of the formation about each planet of two terrestrial atmospheres, the third and fourth discrete degrees in the atmospheric series, or the third and fourth auras, which are the ether and the aerial elementary.

THE SATELLITES. Second in importance, in the breaking up of the primal solar crust, are the satellites; and, third, the sun spots. These, unlike the planetary masses, or earths, are not solid bodies. They are hollow; they are like bubbles or immense bullular forms, denser on the outside than they are within. They are bodies, therefore, whose internal structure predicts possible abrupt and grave changes, so soon as they shall be carried beyond the dense environment, the strong outside pressures, of the locality where they are brought forth, to a more rarefied region of the solar vortex.[148]

The primitive earth masses, as we have said, were formed in the midst of the thickest portions of the ring or belt around the sun, when its substance fell in together upon itself. But on the *outer* side of that belt, away from the solar center, facing towards the *outer* space, another type of body, the satellite, is formed. When the great encrusting belt is broken, the vortex pressing inward tends to catch great sheets of the viscous metallic matter, and bend them inward, so that they belly in toward the sun like great sails. These great be'lying sheets, by virtue of their viscous state, and the proneness of all their constituent finities to press towards circling

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[148]Principia, part III. Chap. III. 7.

orbits of motion, will tend to drop their edges together, to meet, to close about the volume of the vortex aura caught within it. The result will be the formation of a vast hollow cosmic ball, consisting of a more or less thick crust or envelope of fourth finites which enclose a great volume of the second aura. Nor will these new bodies have a polar flattening as the planets have, but will be perfectly round by reason of the equal pressure extended in every direction by the enclosed elastic bullæ. Such are the satellites, according to Swedenborg.

The Sun Spots. And now as to the sun spots,—their point of origin is on the *inner* side of the great encrusting girdle of the sun, when this girdle breaks up; that is, on the concave side, facing the active star center. Here the force of the central space acts immediately upon it. Therefore, when it gives way, great sheets of the crust on the inner side will be bellied and driven out, and the viscous metallic matter curling back over its edges dropping together and meeting, will close in about the volume of fiery second finites driven against them.

Thus arise great cosmic bodies, hollow, with enveloping crusts of metallic primitives, surrounding fiery active high-pressure centers of second substantials. They are thus vast cosmic bubbles arising at the junction of the star center with its envelop-

ing crust or girdle; and their state is necessarily that of bombs highly charged. And so soon as the wheeling vortex carries them out of the region of condensation pressure, they have in their constitution the inevitable conditions of instant expansion and explosion. Such are the bodies to which the phenomena of sun spots are due, according to Swedenborg.[149]

Further Development of Planets and Satellites. All the types of bodies, formed from the viscous metallic crust of the sun, planets, satellites, and sun bubbles or sun spots, continue to rotate about the sun, even as the substance from which they were formed rotated about the sun before they were shaped.

Gathered up by the aura-flow, they swing at first round and round the sun in the plane in which they were formed; but little by little, at every circling round, their wheeling motion enlarges its diameter; and they are imperceptibly carried away from the region where they were formed, where the outside pressures are great, to regions where the aura about them is less compressed, less dense, more and more rarefied.

During this progress from the center of the vor-

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[149]Principia, part III. Chap. III. 7 *et seq.*

tex, not much can happen to the genuine planets, the resistent solid masses of the primitive earths. They will grow smaller as they go, in proportion as the outer layers of their materia are lifted and wound off, in the weaving of their enveloping garments of third and fourth ether. This we have already indicated, and shall return to it in detail.

With the satellites a different possibility comes into play. Satellite forms, as we have seen, are shell-like crusts of viscous metallic primitives enclosed around a volume of the vortex-ether, the second or magnetic aura which makes the vortex of each sun, or solar system.

Now when forms of such constitution are borne outward to regions where the surrounding volume of second aura is under less pressure and more rarefied, then, in proportion as the volume of second aura outside the shell of the satellite is lessened, the volume of second aura inside the satellite will expand, or strive to do so, until it is in the same state of density as the aura outside. So long as the crusting substance is viscous, this will lead only to a gradual enlargement of the satellite, as it travels away from the vicinage of the sun. And if the crust is thick enough and yielding enough, to accommodate itself to the strain without breaking, nothing further will happen. But if the outer crust grows too thin in

places, or too stiff to yield, vents will be opened in the crust like safety valves, permitting sufficient of the inner volume of aura to escape, in order to equalize the pressure of the aura without and the aura within. In that case, the crust of the satellite will probably wrinkle back, puckered and folded, like an apple when half its juice has evaporated from it. This seems to be what has happened to our moon, judging by its appearance.

There is, too, always a possibility that these opening vents and cracks may be so large, and so abruptly made, that the whole crust of the satellite will break up into a dozen pieces; in which case there would no longer be any satellite, but there would be a dozen little asteroids or meteors, swarming and swimming around on the tide of the vortex.

The opening of vents in the crust of a satellite would not militate against the existence of human beings upon it. The satellites are embosomed in the auras, which bathe them about and touch them on every side; and wherever the auras are, there is life, and formative life.[150]

The substance of the satellite crust is of the mineral kingdom, and sends out continual radio-emanations in impalpable clouds. Wherever these are,

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[150]Ath. Cr. p. 8 39; Corp. Phil.

there exist the substances out of which the life-formative fashions to itself bodies of use. Given, therefore, the life-formative of the foam auras, and the radio-emanent spheres of the mineral kingdom, vegetation can begin. And when vegetation once begins, new radio-emanent spheres or clouds of effluvia are sent forth from this new kingdom, providing thereby for the next grand stage, the creation of the animal kingdom. It is literally thus that creation does begin on any planet, and so does it climb from clod to plant, from plant to beast and man. There needs to be first but the life-formative, the living auras, as the active; and for its passive the stuff and substance of the satellites and planets, with their radio-emanent spheres of particles, indefinitely ponderable, but capable of being organized into forms of use by the inflowing and encompassing auras. And we would note in addition a remarkable fact, that when such a sphere has been given forth from an organic form, the sphere remains even though the parent form itself dies. The oxygen salt, volatile, aerial, which the plant gave off last year, the animals breathes to-day. Thus do the living auras, framing vegetative bodies from the radio-emanations of the mineral kingdom, prepare for animal and human life upon the earth; and thus do we see imaged in nature itself immortal life and immortal

use in a higher sphere, after the original form is dead.

The supremely human formative, the first or celestial aura, is universal; and thus prior to suns and systems. The second aura must also come into existence, before the satellites and planets can be created, for these exist by the compression of the particles of that aura. They are, in fact, afloat in it, carried on its solar tide. The third aura, the vegetable formative, begins to be woven about the satellites and planets, as soon as they leave the sun. The aerial elementary follows next in the series. Then water. Then the stuff of the mineral kingdom, the very earth crust of the planet or satellite.

All these are now at hand and ready for vegetation to begin; and as soon as it begins, the planets and satellites begin to give off, into the interstices of the aerial elementary, spheres of inert, angular particles, indefinitely ponderable, which are the primitives of the whole family of oxygen and sulphur, and on down the list. Nothing more is needed, one might almost say, but the dust of a world, and the living hands of the bullular auras to conjoin that poor dust to their own vital motions; nothing more is needed but the unition of the passive of the earth's crust to the active of the auras, a salt to a bullular form, and the framing of these

two into a concrete unit, reactant to the Divine,—able to bring forth therefrom spheres for present and for future use; for the sphere remains, as we have said, even though the parent form itself was broken long ago.

The Satellites, finally, as we have shown, are bodies of a bubble constitution,—not the constitution of a bubble or bulla with an active self-directive center, as the bullæ of the auras, but with an atmospheric or passive center, their crust enclosing a volume of the second aura. This bullular constitution of the satellites seems to account for their behavior in their relation with the planets.

A body of such a constitution, variable and elastic within, cannot serve as an object upon which the pressures of a surrounding sphere concenter, able to react to them as a stable fulcrum, such as the unyielding solid planets are; thus they cannot remain stably in place, as a pure passive subject of converging pressures; nor are they able as little suns to serve as the active soul or parent of a developing system. This relegates them, for their freedom and their existence, to occupy the circumambient sphere of some other center.

## CHAPTER IV.

## THE NATURAL ATMOSPHERES AND WATER.

The Solar Vortex. The envelope of the sun, and the surrounding volume of the second aura, constitute the solar vortex. The mass of the second aura is created around any star or sun by its action in or upon the first or universal aura, and the mass or volume, so brought into existence, is thereafter inseparable from that star or sun.[151] This volume of second aura takes the shape of a great vortex ring.[152] The equatorial diameter of this ring is as wide as the extense of the system which depends upon the animatory motions of that star for its light and heat.[153] The polar diameter of this vast vortex ring is much less than the equatorial diameter.[154] At the poles of the ring there are reentrance-spaces formed like cones, with their apices towards the solar centre.[155]

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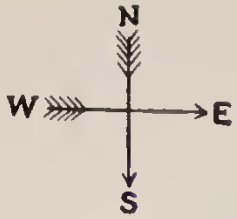
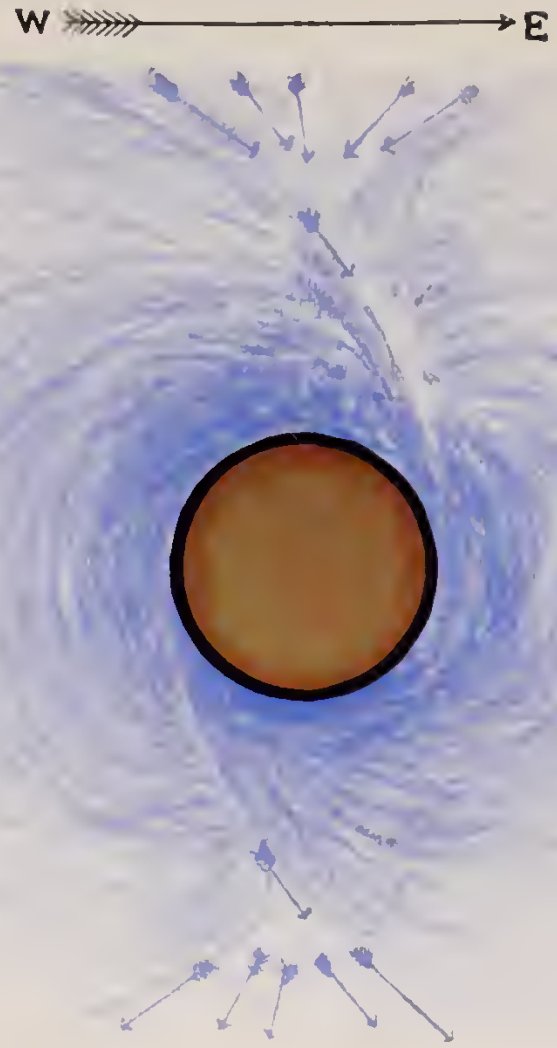
[151] Principia, part III. Chap. I. 4.
[152] Principia, part III. Chap. I. 2-6.
[153] Principia, part III. Chap. I. 2.
[154] Principia, part I. Chap. III. 21.
[155] Principia, part III. Chap. IV.




THE SOLAR VORTEX.

The gold and red represent the active centre of first and second finites. The black ring represents the envelope of third and fourth finites, and the blue sphere the volume of second aura.

The bullæ of this entire volume of second aura at length become disposed in a perfectly equilibrated and regular arrangement.[156] The volume of the vortex ring possesses *en masse* a perpetual vortico-spiral circulation, as well as a general axillary rotation.[157] The axis of the general rotation passes through the cones, and is from West to East, as this is the course of the revolution of the planets in their orbiting around the sun; and the planets revolve around the sun chiefly because they are buoyed and borne along by the rotating motion of the vortex itself.[158]

When the bullæ of this vortex-volume of second aura are thus fully arranged and connected, the bullæ nearer the sun being the more compressed, then the perpendicular flow (N-S) of the vortex as a whole will be impeded by the necessity that the swifter currents near the sun should wait upon the dragging slowness of motion in the circumference.[159] But the general rotary motion (W-E) will remain in unimpeded actuality for the whole mass. Hence the general axillary motion of the whole ring will make a full revolution, while the vortex *en masse*

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[156]Principia, part III. Chap. XI. 1.

[157]Principia, part I. Chap. III. 22; Chap. VI. 36, *et seq.*

[158]Principia, part III. Chap. XI. 3.

[159]Principia, part I. Chap. III. 23.

achieves only a single step of the N-S or vortexing advance.[160] Hence the rotary motion of the volume of the vortex around its axis will be rapid. But its other motion, its perpendicular, vortex, or N-S flow will be tranquil; and as it were of a serene, almost latent current and pressure.[161]

The other or vortex motion, at the polar cones of the solar vortex, is from North to South. This is assured because the earth lies in the course of the general flow of the solar vortex; and the current of that flow passes over the earth from its south to its north pole, "and so tends back into its vortex."[162]

Moreover, as the endeavor and motion of this vortex current is not exactly perpendicular, or in a straight line from South to North, but always acts with a certain simultaneous side-trend and effort from West to East, arising from its intrinsic vortico-spiral activity, with a sort of screw-thread twist,—this general twisting action of the vortex of second aura or magnetic element, in its passage over the earth, will tend to roll and revolve the earth itself around and around on its axis.[163] And, as the sec-

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[160]Principia, part I. Chap. III. 23.

[161]Principia, Part II. Chap. XV. 3, 4; Part III. Chap. I. 2.

[162]Principia, part II. Chap. XV. 3. 4. 5.

[163]Principia, part III. Chap. XI. 3.

ond aura everywhere interpenetrates the bullæ of the ether, the air, the waters of the earth, and all its layers of upper soils and minerals, it lays hold of the globe as it were by slender but omnipotent fingers, and turns it about day by day.[164]

THE BULLÆ OF THE SECOND AURA are dilated towards the circumference of the volume, and more and more compressed towards its center, until this increasing compression terminates abruptly in the extreme condensation of the encrusting flamy metallic envelope or body of the starry sun.[165] Thus the envelope or body of a sun, and its vortex of second ether, form as it were one body; and the two rotate as one. Or we may perhaps call the volume of second aura about the sun a sort of atmospheric extension of the sun's envelope. And it is in such intimately graded connection therewith that the two necessarily turn about as one, as a man's body and his sphere make one; or as it is with the magnetic needle and the magnetic sphere. And as the iron of the magnetic needle is turned about by the turning about of its sphere by a finer elemental vortex,[166] so here we may consider that it is the living vortex flow of the primal aura, both interpenetrating and

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[164]T. C. R. 30.

[165]Principia, part III. Chap. XI. 1; part I. Chap. IX. 4.

[166]Principia, part II. Chap. XV. 8. par. 2.

surrounding the volume of second aura, which turns it continually and bears it along, and the flamy crustal body of the sun with it, so that the two necessarily revolve as one.[167]

Hence the envelope or crusted body of the sun itself is in continual rotation, in the same direction as the planets travel. And, moreover, whenever in that enveloping flamy crust of the starry sun the breaking solar bubbles we call sun spots are perceptible, these also are seen to be carried along in the same general direction; as if they also travelled around the sun.

The circumfluent volume of the aura of the solar vortex never penetrates into the active interior space of a star.[168] The spiraling curves of the vortex therefore circle about it, as if they embraced its space round about, in soft arching curves. From this there results a peculiar irregularity in the absolute rotation of the flamy, half-fluid encrusting envelope of a star or sun. The northern half of the envelope always rotates a little faster from west to east than the southern half.

The solar vortex, including the sun-envelope, always possesses some trace of the two motions proper

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[167] Principia, part I. Chap. IX. 5; part II. Chap. I. 1, 2. E. A. K. part II. 312.

[168] Principia, part III. Chap. IV. 2.

to the intrinsic vortico-spiral conatus of its bullæ. The currents of the vortex gyre, near and about the sun, are therefore not only in their common rotary motion about the axis of the vortex; but they retain also their common endeavor and pressure along the lines of the vortex or progressive motion; although this progressive or vortex motion of the aura volume is extremely slow. The stream of this motion moves of its own impulse and nature in a large full half curve from north to south. If the effect of this slower subsidiary motion be considered separately from the swifter and chief rotary motion, it will be apparent that the general rotary movement of the upper part of the vortex volume near the sun would gain a little on that of the lower.

For the general slant of the curve of this subsidiary progressive motion, from the north pole of the sun's envelope to its equator, will coincide in general with the common rotary motion of the sphere. It therefore adds itself thereto, producing a trifling acceleration of the absolute speed of that rotation. From the equator of the sun's envelope to its southern pole, the reverse of this will be true. The slant of the curving subsidiary motion will be counter to the common rotary motion of the sphere, and will subtract therefrom. It is as when a man on board a boat paces the deck back and forth, now going

with the general stream of the boat's motion, and now against it.

The fact that the northern hemisphere of the sun's half fluid envelope rotates from west to east a trifle faster than the southern hemisphere, a fact indicated in Swedenborg's postulates as to the two directions of advance present in a true vortex circulation, has been noted by astronomical observation.

The Active Solar Centre, of living animatory force within this envelope or body, acts that animatory motion continually into its enveloping body, as a motion of alternating expansion and contraction; and from its body, so intimately one with its atmospheric spheres or vortex, the effect goes out as communicated waves of alternate contraction and expansion endlessly running through the elastic bullæ of the surrounding volume. Each recurrent expansion of the active solar space sets the dense envelope about that expanding solar center into sharp fluctuations, which give an impulse and pressure to the elastic foam-texture of the second aura around it, and starts a sort of wave, the undulatory pressure of which runs outward from the sun through the vortex volume wave after wave; every impulse of the sun's expansions tending to expand the vortex also. It is as if the solar space or sun were the great pulmonary center of its system, and at each expansive

motion of that miracle of inner solar breathing the whole vortex like a mighty breast lifts and expands.

LIGHT. Thus light is an undulatory wave motion or pressure running through the vortex, from the sun outward. The impulse, the inciting force, of these undulations of light, is the alternate expansion and contraction of the active solar space within the sun, called by Swedenborg its animatory motion, derived from the reciprocal cardiac and pulmonic activities of the Divine in His creation. That light is an undulatory motion or pressure, see E. A. K. part I. 170: Lesser Principia, 118. 121. 130. That the spring and origin of light is animatory motion, see E. A. K. part I. 300. That the origin of the undulations of light is animatory motion of the sun and the stars, see E. A. K. part I. 170. That the animatory motion itself is an alternate expansion and contraction perpetually kept up, see E. A. K. part I. 299. That such animatory motion may always be truly called a breathing, see A. K. 392. b. That animatory motion is derived into the universe, as into the heavens, by the pulmonic and cardiac motions which the Lord acts into the Spiritual Sun, see D. L. W. 392. That the interior activity of suns and stars, in their use, is immediately the act of the spiritual Sun within them, for if withdrawn they would collapse, see D. L. W. 157.

Outside the vortex-ring Volume of Second Aura, the *first* aura exists; for it is the universal or interstellar aura.[169] The vortex ring volumes of a second aura exist as it were submerged in, and embraced all about, by the first aura. The innumerable stars and their vortices exist therein as local active centers, where the series of creative-proceeding is to be produced to new localized ultimation; therefore the circling motions of each volume of second aura regard its central star or sun.

The Determinations of the First Aura are not the same as those of the second; nor does the sweep of its currents regard any star, but they are co-extensive with the breadth of finite creation.[170] Therefore the center it regards is a universal one, indeed; and the light it inmostly carries is that of God, the Moral Sun, the Sun of Wisdom and of Life.[171] Hence all the vortices of the second aura ever created, each with its springing motion about its own active center, are thus wholly embraced around by the primal aura and borne deep in its bosom, and are carried by its supreme tides, as it were not knowing, to such purposes and places as God wills.

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[169]Principia, part I. Chap. VI. 50.

[170]E. A. K. part II. 272. 312. 339. 350.

[171]E. A. K. Part I. 306; Part II. 238, 255, *et seq.*, 260 *et seq.*

For by it the universe is ruled; by it, greatest forms and least are held together; and by it, ends flow through orderly sequence of means, to results.[172]

The first aura is not only present outside the vortex volumes of second aura, embracing them about and holding their mass of bullæ together in a coherent contiguous volume; it is present *within* this derivative vortex also, filling the interstices between every bulla of its volume, and equilibrating all things therein by its pressure. Thus everywhere within a solar vortex, the bullæ of the first aura and the second flow together in one vortex volume; and nothing so small can exist in that vortex that it is not bathed about and acted upon by both the first and second auras.[173] The primal planetary masses are conditioned with this environment from their first moment. The bullæ of the first aura and the second flow about the primitive earths, everywhere pressing their surface, urging, acting, sustaining and mou'ding as by liquid hands.

It is the common rotary motion of the vortex which swings the primal earths about the sun from their first existence. And it is a'ong the flow of the vortex, as by the great highway of a common

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[172]A. K. Part IV., (VI.), 2. 6; E. A. K. Part II. 272, 312. 339.

[173]Principia, part I. Chap. IX. 5. par. 2.

stream, that those earths are carried outwards from their common birth-place, immediately around the active solar space, by widening circles, each to his own place and distance, there to circle in its own orbit and freedom everlastingly. This distance is not the same for any two earths; although the common carrier-stream of the vortex is the same for all, no two of the primitive earth masses find their own place and freedom at the same point of the circle.

So soon as the great crustal envelope of the sun collapses into the globular masses, an ordering action begins in these globes. Under the conditions of the surrounding pressure, the finites or vortex rings of which the spherical earth masses are composed, must begin to slip into place among each other, pole to pole; since that is the mutual arrangement in which they take up the least room. Moreover, all the finites of which the earth masses are composed, are compounds of the primitives of the Spiritual Sun, and the everlasting reflexive conatus of these primitives to a circling and recircling motion is everywhere within them. Thus as soon as the finites composing the earth-mass are adjoined pole to pole, a certain common push and endeavor of the whole mass will make itself felt, from the push and endeavor common to each finite of that mass. In this manner the enormous volume of the finites con-

stituent of any planetary mass, will almost at once come to be arranged into a perfect order and flow; slow, impeded, indeed, but yet real, and emulous of the circulation in the interior of a finite. So soon as this occurs, the primitive earth will cease to be a perfectly round ball-like mass, will become flattened at the poles, in emulation also of the generic configuration of a finite. At this stage each earth will assume the character, and possess the active powers, of a finite; a large finite, or substantial. "Every planet, therefore, however great . . . is only a larger finite; the difference between the two consisting only in degrees and dimensions."[174]

The powers and motions of earths, as astronomical bodies, refer themselves back to this interior condition. The very conatus to axillary motion they get from this interior arrangement and circulation of their substance.[175] And it is from this intrinsic ground that all earths derive their endeavor and power to that large motion *en masse*, which describes continually about the sun the great circle of their orbits; and presents a very image in vast outline of a finite left in its free and unimpeded motion.[176]

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[174]Principia, part III. Chap. V. par. 1.

[175]Principia, part III. Chap. XI. 2.

[176]Principia, part III. Chap. XI. 3.

The primitive earths, however, differ in size, as finites also differ in size. No two earths, probably, in all the universe, are exactly of the same dimensions. Thus earths would come under the law of finites, the law that all of their orbits are of the same general type, but differ in size; small finites describing orbits of small diameter, and large finites of large diameter. The diameter of the native orbit of a finite is always in direct proportion to the mass of the moving body; so it is with the earths of the universe of so many sizes; yet each describes an orbit strictly commensurate to its individual power and form and mass.

THE PROGRESS OF THE EARTHS TO THEIR ORBITS. And now a word more as to the progression of the primitive earths from the sun outwards to their orbits. As the second aura is a foam-structure of a relatively coarse order, the ether of a solar vortex cannot be regarded as a wholly frictionless medium. This, however, does not oppress the motions of the planets. That stream is frictionless to us, with the flow of which we ourselves spontaneously run. Thus the aura of the great solar vortex is frictionless to the planets, which are borne along in its circling stream, as boats might ride in some great maelstrom flow of the sea. Nor is there even so much of friction as is implied in this image. The

earths are not only passively borne in this revolving flow; they go spontaneously.[177]

The primitive earths, all starting alike from the near presence of the sun, travel by successively widening circles from the region of greater density to less; until each earth reaches that particular circle in the vortex, where it is in individual freedom in its relation with the vortex and with respect to its own proportional size and mass; and where its own conatus to orbital motion coincides with the diameter of the revolving volume of aura which carries it.[178] Thus each earth finds its own free and rightful place in the stream of the great whirling vortex which carries it about the parent sun; and it thereafter continues to move on that particular wave of the circling stream, as its own particular orbit, age after age unceasingly. Nor will there ever be any friction to stop the motion of the earths; even though the second aura is not abstractly a frictionless medium. Still less is an aura in motion frictionless. But the stream we go with is frictionless to us; and where the aptitude and power of the interior circulation coincide with the measure and flow of the outer cosmic stream in which it is borne, as in every stream of Providence, there then exists the image

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[177] Principia, part III. Chap. XI. 3.

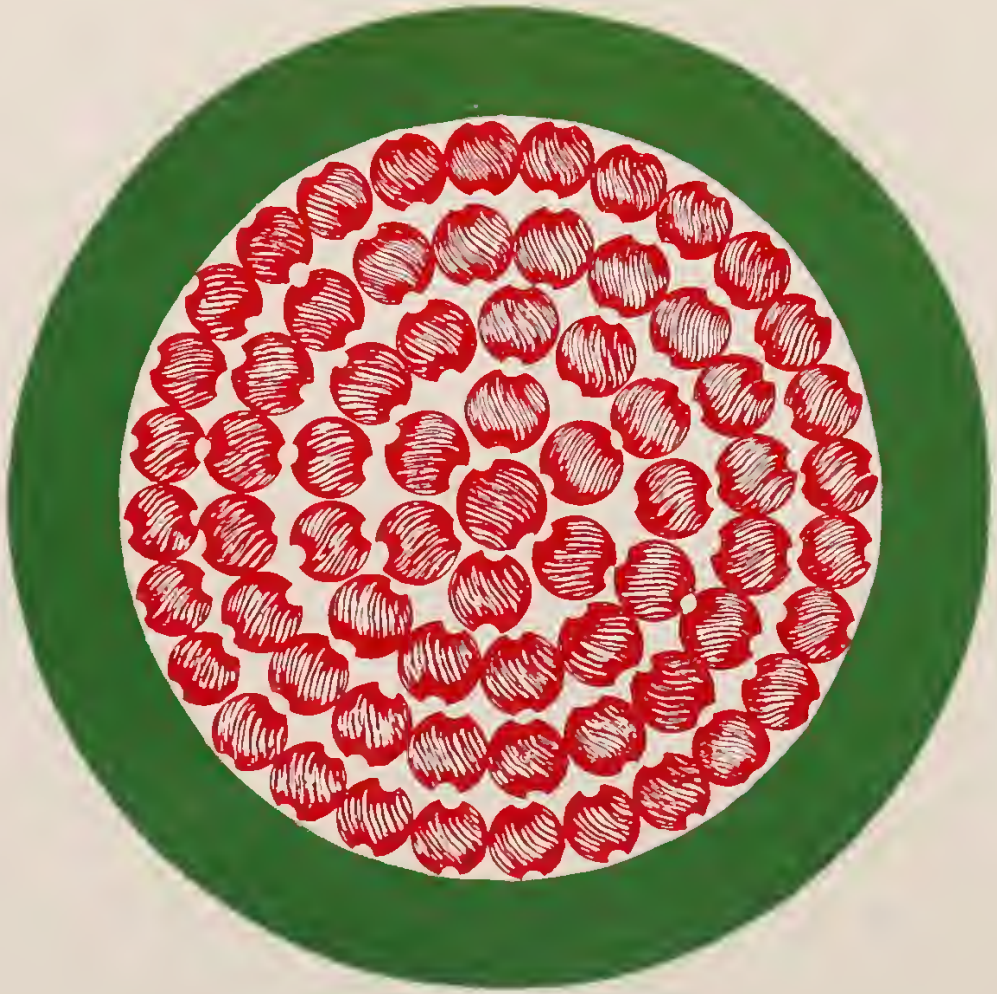
[178] Principia, part III. Chap. IV. 7; Chap. XI. 5.

and ideal of freedom itself; and the push and flow and determining crowd of the surrounding stream is unperceived.

During the time taken by the raw mass of a primitive earth to pass by circling gyres from the sun to its own place and orbit in the vortex, many things are accomplished for it; and many things happen to it.

First and foremost of its conditioning is, that it leaves the central region of the vortex, where the density of the medium is high and where the undulations of light and heat, communicated by the animatory motion of the solar center, are in their fullest and most immediate force. From this region each earth travels by gradations through regions where the vortex density continually lessens, and also the undulatory pressure of the outgoing waves of light and heat. And alike when near the sun, as when departing from it, the earth mass is surrounded, acted upon, compressed, and carried, by the vortex itself, in which vortex both the first aura and the second are distinctly together. For the first aura is interstitially between all the bullæ of the second aura; and so surrounds, embraces, and urges them all.

The Third Aura, or Ether. Now the primitive earth masses, having the constitution of solid balls, cannot expand, on reaching an environment of lesser



A Bulla of the Third Aura or Ether.

Cross section ; the red represents the active centre of first aura bullæ, the green the envelope of fourth finites.

density, as the sun spots and the satellites do. What happens to the earths is contrary to this. Their mass grows smaller.[179] For when an earth has entered a region of somewhat lessened density, the finites composing the surface layers of that primeval earth mass, loosen and free themselves, especially on the side turned towards the sun, and whole outermost layers of the dense earth-mass lift softly and lightly. The finites freeing themselves from the bond of their mutual pressure, begin to float in little finest curves and turns, according to their own inherent will of motion. By this means, in the course of the repeated diurnal rotations of the earth, it becomes surrounded by a sort of free halitus or sphere of the same substance, the same substantials, as those of which its core is composed.

So soon as this halitus of fourth finites begins to arise from the earth, as if the earth were evaporating away at its surface,[180] it everywhere enters and circles in and among the bullæ of the surrounding vortex. Then little volumes of the first or celestial aura gather up the finites of this floating sphere, press them together, and form of them minute spherical envelopes of a diameter commensurate

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[179]Principia, Part III. Chap. V. 1; Chap. XI. 2. 3.

[180]Principia, part III. Chap. V. 2.

with their native orbits. The volume of first aura, which formed such an envelope of fourth finites about itself, remains in that envelope, as it were the soul and active interior space of that particular bulla; while the envelope is as a sort of body, formed from the fine primeval mother-mass of that particular earth;—a body which the central volume or soul of celestial aura has formed to itself for the performance of a new and more ultimate degree of vital use.[181] Thus it is that as the earth passes outwards, all around it there begin to originate new bullæ, of a larger size than any hitherto; and these new bullæ are as entities begotten by the first or celestial aura as an active from the finites of the mother earth, as reactive. These bullæ are the very bullæ of the third degree of atmosphere, technically called the ether.

These new bullæ differ from those of the first and second aura, not only by their greater size, but in having envelopes which are perfectly round, and without polar openings or cones. Thus it is impossible for bullæ of the third degree of atmosphere to be colligated pole to pole and form long pores and channels, in the same way as can the bullæ of the first and second.[182]

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[181] Principia, part III. Chap. V. 2-7; Chap. X. par. 2.

[182] Principia, part III. Chap. V. 4.

As we see with bullæ of warm vapor or steam, the tendency is to rise from the surface of the earth, where they are formed, into a higher region, and that this tendency is great in proportion to their heat; so here with the bullæ of the third atmosphere or ether. As fast as they are formed, being as it were exalted and empowered by the beams of the sun near at hand, they expand and mount on all sides from the earth; and as they mount, new bullæ, shaping from below, follow them, and still new ones are shaped at the surface of the earth and pass upward. Thus an atmosphere of new and larger bullæ of a different type is as it were spun and woven as a vestment about the surface of the earth. The volume of it became very great. And it did not cease to be formed in continually enlarging mass, until the earth, in its farthest journey from the sun, entered regions where his heat in a marked degree grew less. For when it reached so great a distance that the bullæ of the outermost circumference of volume of ether, already formed, began to lose the first warmth communicated by the near presence of the radiant sun, then those bullæ of their own accord no longer sped away from the earth, but as it were drove back upon it; in every pressure seeking to return, as they chilled and contracted. With this, the further formation of the ether sphere would cease. Thus about each of the primitive earths there was formed a sphere

of ether, or third atmosphere, individual and as it were personal to that earth alone.

In all the productions and changes characterizing the formation of this third aura, each earth-mass must act as reagent in the process for that particular volume originating around itself; its own motor powers, rotary and orbital, are part of the instrumental means of the production. Its own substance is given off from its mass to form the envelopes of the bullæ; and the site where those bullæ are first formed is immediately about its surface, where the first and second auras encompass and press upon its rounded sides. To this ether the eye is formed. To this is formed the common sensory plane and animus.[183] It gives also the life-formative of the vegetable kingdom and of the insect world..[184]

The volume of third aura or ether is in no case similar in all respects on any two earths of the universe. Therefore the pressure and habit of its action differ on all earths of creation; and the play of the living sensory organs, afterwards framed to receive and reciprocate the motions of this third degree of atmosphere, will differ on every earth in the universe; and that so distinctly that sensory organs

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[183]The Soul, 69. 95. 97. 101.

[184]Corp. Phil.

framed to the powers of this ether upon one earth, if transferred to the ether sphere of another earth, would be without their usual power of sense-reciprocation. The eye, seeing upon one earth, would be blind upon another. The planes of imagination would all lie differently. And the vegetation of one earth would be of forms unusual to another; and no two worlds are the same as to atmospheres, earths, or forms arising out of them.[185]

This third atmosphere is the ground of the celestial-natural heaven, the heaven of the vegetative paradises. And the fact that the volumes of this third atmosphere are as many as the satellites and planets created, is the elemental basis of the further fact, that the number of natural heavens is as many as the number of satellites and planets; that each satellite and planet is surrounded by its own local natural heaven; that their genius is not alike; and that the man who has his interiors opened to the degree of the natural heaven, who lives in the common imaginative sensory, is able to live and make his everlasting home only in the near vicinage of the surface of the earth upon which he was begotten and brought forth. For only to the air and ether of his own earth has his ear, his eye, his common sensory,

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[185]D. L. W. 318. Principia, part III. Chap. II. 3. 4.

and their plane of life, been framed responsive; only there do men exist of the same genius in lower planes with his own, with whom he may be associated, and of their life partake.

The Fourth Aura, or Air. The like law of planetary differentiation and localization exists for the fourth atmosphere, the aerial elementary, which is the last of the active bullular atmospheres properly to be called ethers or auras. The second aura and the primitive earth-mass bear the same mutual relation and office in the production of the fourth aura or atmosphere, as the first aura and the mother mass of the earth in the production of the third aura or ether. The first aura and the primal-earth mass are as active and reactive in framing the constitution of the bullæ of the third atmosphere. The first aura exists in the internal or nuclear centre; the substantials or fourth finites of which the earth is composed forming their enveloping bodies. The second aura is the active to the reactive of the substantiates of the primal earth in the production of a fourth aura. The bullæ of this aura will then have a volume of second aura as a nuclear centre; their enveloping body having been taken from the mother mass of the natural earth. This fourth atmosphere does not enter the human body; although it has an organ formed to itself, the ear. In this atmo-

A Bulla of the Fourth Aura or Aerial Elementary.

Cross section; the blue represents the active centre of second aura bullæ, the brown the envelope of fifth finites

sphere the spiritual-natural heaven is founded. In the formation of the envelopes of the bullæ of the fourth aura, the substantials or fourth finites of the earth mass are not used immediately or individually, but certain grosser finites, called fifth finites, concreted from the fourth finites by free composition. Thus the fifth finites are more ultimate, lower, and finited, than the mass of the planetary core itself. This appears in all their uses. Indeed, to the activity of the fifth finites our atmospheric fire is due,[186] the activity of the fourth finites being the elementary electric fire.[187]

The formation of fifth finites takes place at the surface of the planets, wherever great layers and masses of the fourth finites have freed themselves from old connections; moving one among another they mutually finite themselves into a new and more compounded grade of vortex-ring entities than has yet existed.[188]

These new finites possess all the powers of the previous finites; they have an interior circulation, and spontaneously rise and run and circle in a certain orbit.[189] They move, however, far more slowly,

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[186] Principia, part III. Chap. VIII. 4. 8. 15.

[187] *Ibid.* 16.

[188] Principia, part III. Chap. VI.

[189] Principia, part III. Chap. VIII. 3.

than the fourth finites do; and the diameter of the orbit they describe in their motions is much greater. When such finites, therefore, rise and move in swarms over the surface of the earth, the circle of their reflexing activities will be wide enough to inclose in its limits a volume of the bullæ of the second aura. Then that volume of second aura, with first aura bullæ in its interstices, will convolute and roll these finites, and form of them relatively large spherical envelopes. Of the large bullæ thus formed, the volume of fourth elementary is composed.[190]

Origin of the Water Molecule. The volume of the air or fourth atmosphere was never so large as that of the ether or third atmosphere; and a large portion of the original volume has been compressed into materia for the earth's uses. There is now left, therefore, but a comparatively thin envelope, not many miles thick, pressing closely upon the earth's surface. This is the atmosphere the lower layers of which were compressed into *the waters* and grosser materia of creation. For the waters which cover the earth, the salts of the sea, the rocks of its upper crusts, are formed directly, not from the materia of the planetary mass, but from compressions of that fourth aura.

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[190]Principia, part III. Chap. VII.

The general cause of this compressive action is the passage of the earth, with all its great surrounding volumes of third and fourth atmospheres about it, into regions of the vortex sphere far colder than those where the volumes of the third and fourth atmospheres were formed. The immediate agency of the compression is the immense return endeavor, or return pressure back upon the earth, of the cooling and contracting bullæ of the great volumes of the third and fourth atmospheres. The sum of this contraction-endeavor of the whole vast spherical volume is directed and massed from every side towards the centre of the solid resistant globe of the primitive earth. The globe cannot yield nor can it be pushed away. It is solid. And from every side like pressure comes, from like causes, which sustains and prevents escape. The immense return conatus and effort of the vast cooling sphere of atmospheric bullæ, concentrating its radii in towards the earth, brings an enormous pressure to bear upon the bullular texture of its own volume in the vicinage of the earth, and upon the volume of the fourth elementaries particularly; since that volume is more ultimate and finite, and with relatively less spring of interior resistance and reaction.

The bullæ of the fourth atmosphere caught under

this cooling pressure, and driven towards the unyielding surface of the planet, are as it were compressed to their lowest and smallest dimensions until each is reduced to a small, round, unyielding little mass. This new little mass is not homogeneous. The fifth finites of the envelope of the parent bullæ, the same as those of the atmospheric fire, will still form the exterior of the mass; the third finites of the envelopes of the bullæ of the second aura, enclosed in the nuclear centres of the parent bullæ, the same finites which constitute the primitives of the finer group of metals, will fill the centre. Thus the new particles, spherical in form, non-elastic or solid, the first really material thing formed in creation, will consist, as we have said, of two constituents, namely, the primitives of the metallic family, and fifth finites or those belonging to the later atmospheric fires.

Now these new, spherical, hard molecules or masses, thus formed by the compression of the lower layers of the fourth elementary or atmosphere, are actually the molecules of water. The ether, interfluent in their interstices, renders them fluid.[191]

Hence under the enormous pressure of the cooling ether-sphere about the earth, the coarse foam-bullæ

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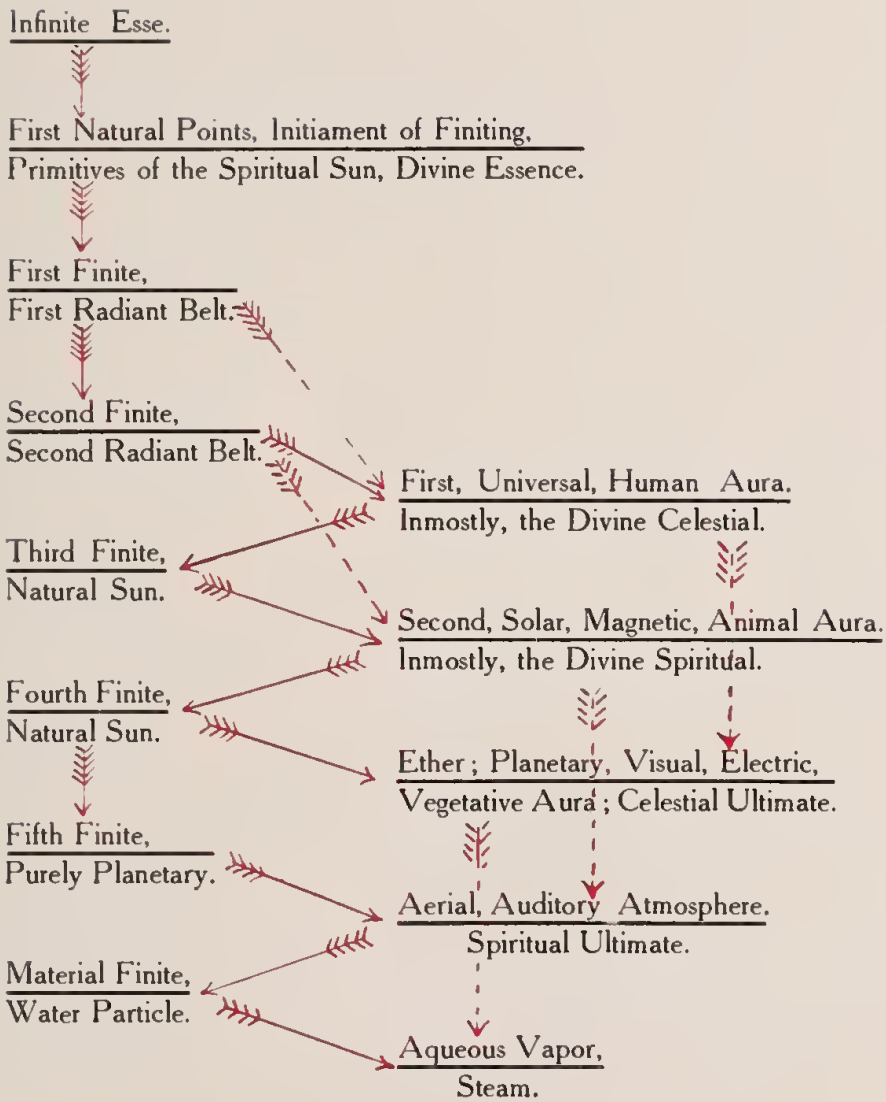
[191] Principia, part III. Chap. IX. 1. 2.

# DIAGRAM




N. B.—Continuous lines (⟶) indicate successive formation.
Dotted lines (- - - - ⟶) indicate influx into the interiors.

of the aerial elementary or fourth aura, in its layers next the earth, begin to be so hardly compressed that they are each condensed into a molecule of water. Then there appears over the surface of the mother earth a mass of water, the tide of which rises higher and higher, as layer after layer of the aura or atmosphere above changes its nature and form under the compressing force, until the pressure of the upper atmospheres is for a time satisfied; and a great unsalt sea, leagues in depth, covers the ball of the earth.

## CHAPTER V.

## SALTS AND THE CRUST OF THE EARTH. PROTOPLASM.

The Centrifugal Compressive Force. All the compressive forces acting around an active solar centre to condense new and more compounded substantials from the foam-texture of the surrounding aura, are centrifugal radiant forces. The means of this compression is the action of the whirling gyres excited in the aura by the presence and power of the active centre. For the whirling volume, begun near the sun, everywhere drives outward against the resisting expanse of aura round about. One portion of the aura coerces and presses another portion,—the momentum of that portion which is in motion, acting against the portion at rest, with a subtle, irresistible force. It is in this manner that the third finites were compressed from the first aura, and it is thus that the fourth finites, of which the planets were shaped, were compressed from second aura.

The Centripetal Compressive Force. The compressing instrumentality brought into action about the earths, to bring forth the waters and the angular

particles or the salts, is the very reverse of the compressive force active about a sun. It is a centripetal force, a force originating not from an expansive but from a contractive effort of an aura or ether—not from a higher and finer foam ether in whirling motion, but from a lower and coarser foam ether, in all its volume chilling and contracting.

This type of compressive force can only affect planetary bodies and their immediate vicinage; and their own surrounding volumes of third and fourth aura are the ministering means of the compression. This compression commenced at the period when the two terrestrial atmospheres, already fully formed, began to be carried by their mother earth farther and farther from the genial circle of greater solar light and heat. For as the mother earth carried them into regions continually further remote and more chill, they themselves began to *contract* as they cooled; and not only did they thus contract individually or as to every bullular unit, but as a whole or *en masse*. Then the force of the progressive cooling and constriction of so vast a volume of ether, everywhere directed by narrowing radii inward upon the parent earth, began to produce great and wonderful results.

The earth-globe itself could not be further compressed by the contractive pressures of the cooling

volume of ether thus determined, and as it were focussed, upon its surface. For the globe was already absolutely dense and resistant; nor could it be thrust from its position, since it lay as it were sustained on all sides by centripetal pressures and equal force.

The Compression of the Fourth Aura, or Air. It was the comparatively small volume of fourth aura, the aereal elementary, massed about the earth, that could be affected by this contractive pressure. For the volume of aereal elementary could be caught, as it were, between the anvil and the hammer, between the earth and the pressing contracting ether. Something must yield; and the bullæ, large, sluggish, gross, of the fourth atmosphere, were the only forms in that locality apt to yield.

Under the growing pressure, then, of the whole contracting volume, the elastic bullæ of the fourth aura, near the surface of the earth, grew denser and denser, smaller and smaller; until vast volumes of them were reduced to small, hard, non-bullular, spherical masses, resistant, and inert.[192]

The Primeval Ocean. These new forms, hard, inelastic, round, were the primitive molecules of water; and the volume of such hard molecules, pro-

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[192] Principia, part III. Chap. IX. 1.

duced about the earth, was rendered fluent, and the molecules themselves movable, one among another, by the ether or third atmosphere interfluent in their interstices.[193]

There was formed at length a vast sea of such water particles, miles in depth, fluent about the planetary mass. This was the great unsalted sea, or primeval ocean, which first swept around the globe.[194]

Formation of the Salt Molecule. The effect of the contractive pressures did not stop here. Compression was able to go a step further. The molecules or units of this vast sea were still spherical in form, and being spherical their surfaces pressed each other only at their points of mutual contact. The interstitial spaces between them presented places and planes of less pressure or resistance. If, then, the pressure acting upon them grew great enough, here and there the circumference of the hard, round forms would begin to yield in the direction of lesser pressure, and as it were bulge and give way toward the interstitial spaces. The whole little mass of any round water particle, thus yielding, would be crushed into a new form, a form moulded after the shape

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[193]Principia, part III. Chap. IX. 2.

[194]Principia, part III. Chap. IX. par. 1; Chemistry, Chap. I.

of the interstice existing between the adjacent round particles which still retained their integral roundness.[195]

Plate VIII represents nine molecules of water, the central molecule being the first to yield to the pressure. As its envelope, composed of fifth finites, must be the first to give way, its substance will pass into the adjacent interstitial spaces, shown in plate IX, and the adjoining round water molecules settling closer in upon the crushed and yielding particle, it will be pressed into the shape shown in plate X; this shape will be composed of a central cubic block, consisting of the nuclear core of the original water particle,—a cubic block, therefore, of metallic primitives. At each angle of this central cube will be a tetrahedron block, formed of the fifth finites from the surface of the compressed particle of water. This cubic block, Swedenborg terms an alkaline particle; the tetrahedral blocks are acid particles. Therefore the primeval sea salt, as a compound of both forms, the alkaline and the acid, is basic.[196]

The sides of all angular particles so produced, are of course slightly concave, being moulded to the convexity of the surrounding round particles.[197]

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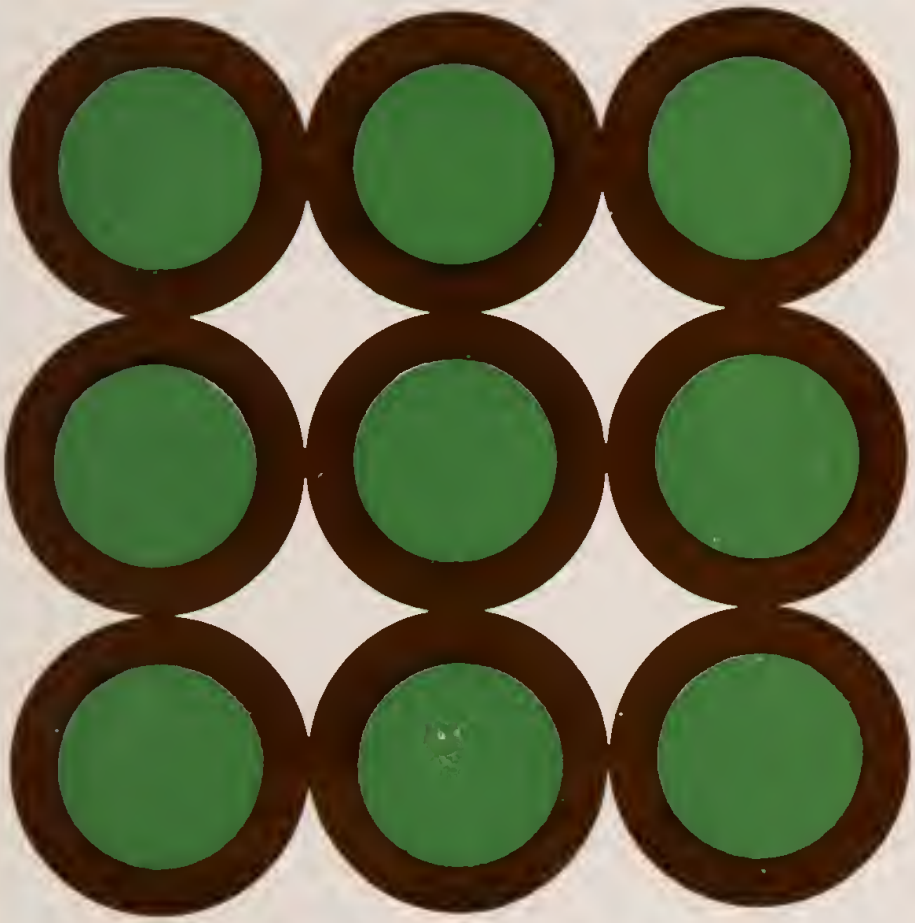
[195]Chemistry, chapter I.

[196]Chemistry, Chap. XI. sec. 9.

[197]Chemistry, Chap. X.

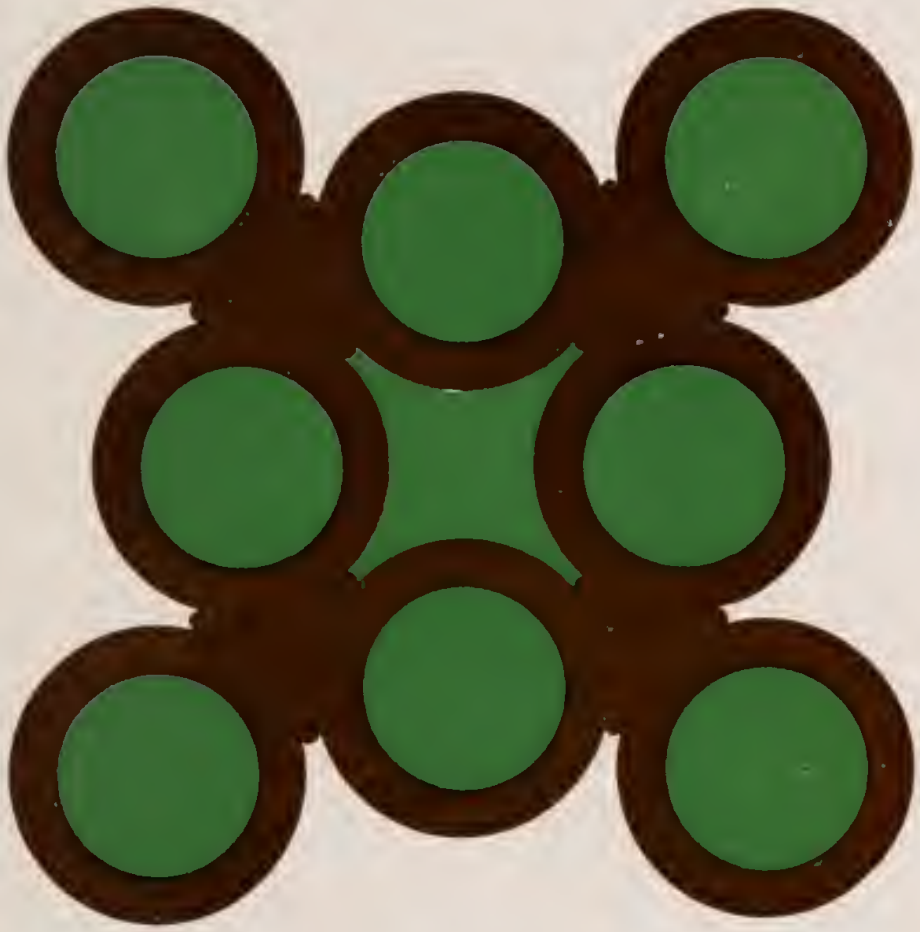
Plate VIII.



Group of Nine Molecules of Water.

Cross section: the green represents fourth finites, the brown fifth finites

Plate IX.



The Same Group as Plate VIII,
with central molecule collapsed.

Plate X.

The Salt Particle.

Formed by the collapse of the central water molecules shown in Plates VIII and IX. The green represents the cubical alkali salt particle of fourth finites, the brown the triangular acid salt particle.

This fits them to connect with any kind of round particles of suitable size, in a sort of ball and socket fashion. It is in this manner that the crystallization of salt takes place; the round molecular particles, necessary to build up the structure of the crystalline mass, being furnished by the water of crystallization.[198]

These complex angular particles, thus formed at the bottom of the ocean, are the very primitives of the halogen salts and other typical bases. As they were actually formed *in situ* at the bottom of the sea, from water particles, and among water particles, they were formed most perfectly and most abundantly. The water particles left uncrushed among them, acted the part of the water molecules of crystallization. The result was the formation of a vast layer of rock salt at the bottom of the sea.[199] This was the last great effect of the contractive pressure of the cooling ether volume.

It was by the wash from this substratum of crystalline salt that the great primeval sea of sweet water grew salt, and is to this day the salt-mother of the earth and storehouse of the basic angular particles of creation.[200]

The Ramenta of Broken Salt Particles. An-

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[198]Chemistry, Chap. XI. sec. 3.

[199]Chemistry, Chap. I. sec. 5; Chap. X. sec. 2.

[200]Chemistry, Chap. X. sec. 2, XI. sec. 1

other form comes into notice here, or rather a part of the form presented by the primevally perfect angular particles of rock salt. Certain delicate wing-like projections exist on every side. They are ramenta curved like the blade of a sickle, thick on the convex edge, but very fine on the concave.[201]

These ramenta are formed of finer finites than the main mass, disintegrated from the coarser, which exist in some near interstice. Every angular or block particle formed in that deep crystalline bed of salt in the depths of the primeval sea, was thus delicately winged at its edges. As the sea dissolved layer after layer of the salt particles, these delicate lamellar portions were broken off by the attrition of that process; and clouds as it were of them must have been loosened, freed, and drifted to and fro in the water of the deep sea.[202]

The Primitives of Carbon. Forms of this type have potencies of use of their own. They are the angular or inert particles which are the mother or passive particles generic to the oi's, the animal spirits, the formative substance of animals and of plants. Bullular particles of water vapor, of the ether, the auras, give the active or father element.

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[201] Chemistry, Chap. XIV. 1.

[202] Chemistry, Chap. XIV. 1

The passive ramental fragments cover the envelopes of the bullæ, either singly or in volume. Bullæ of the ether thus encrusted and loaded with the finest ramented edges, broken from the angular particles of primeval salts, are thus the very basic, generic factors of the oils and spirits and the formative substances of plants, or what emulates spirits in them.[203]

Now in the depths of the primal sea, in the plane where the bed of rock salt was dissolving, the conditions, the necessary factors for the formation of the primal oils, or hydro-carbons, and the formative substance or seed of vegetative life, not only existed, but existed abundantly, and existed in juxtaposition. The attrition of the primal keen-edged perfect salts as they dissolved must have given rise to a vast first production of such free ramental particles; the tendency of which is to attach themselves to any free ether bullæ or volumes adjacent.

THE FIRST FORMATION OF OILS OR HYDROCARBONS. Meanwhile, the conditions of dissolution of salt in the water would cause free volumes of ether bullæ to rise everywhere in bubbles from the depth where the salt was dissolving, to the surface of the sea.

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[203]Chemistry, Chap. XIV. sec. 2; E. A. K. Part I. 75 76.

For the salt particles dissolving in water, do not increase the volume of water, because they only fill and occupy the interstices of the water particles.[204] Therefore, as the salt of the rock-salt bed dissolves in the wash of the primal sea resting upon it, the interfluent ether, or "subtle matter" rises to the surface in the shape of bubbles; and its place is occupied by the salts.[205] Thus all through the lower level of the sea where the dissolving salt is giving rise to a cloud or sphere of ramental particles, the volumes of displaced ether will be rising among them and mounting to the surface in bubbles. It was thus that oils or hydrocarbons first originated in the primal sea.[206]

Origin of the Earth-Crust. Under the conditions just postulated for the primal sea, the displaced and ascending bubbles of ether cannot but attract to themselves the abundant ramental particles or flakes broken from the fine curving edges of the first angular or salt forms, and act as their carriers to the upper regions of the sea. From this cause there arises at length a kind of crust, or covering-over of all the surface of the quiet sea. This crust will be composed mainly of the bullæ of the ether of

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[204]Chemistry, Chap. XI. sec. 2-6.

[205]Chemistry, Chap. XI. sec. 5, par. 2.

[206]Chemistry, Chap. XIV. sec. 2. par. no. 4.

the third order, loaded thus with fine ramental particles. Among these encrusted bullæ of the ether will be drifts and heaps of free ramental carbonaceous particles, together with many salt particles, acid and alkaline, rising entangled in the groups of ascending oily bubbles. This first delicate crust will be thickened continually from below, by the new ramental-ladened bubbles of ether rising from the ocean depths, where the salt of the great primal rock-salt layer is being dissolved.[207]

Moreover, some of the ramental fragments, carried above the surface of the sea and dispersed there by the breaking of bubbles, would readily transfer themselves to the interstices of the elementaries, and gather and encrust about the bullular particles of the watery vapor, formed in the lower layers of the warm, heavy brooding air pressing the surface of the sea. The latter form is carbonic acid, the *"volatile urinous salt"* of Swedenborg's *Chemistry;* formed also of the exhalations sent out in the course of the purification of the sera of the bloods in the lungs.[208]

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[207]Chemistry, Chap. XI. sec. 5. last par. no. 2; Chap. XIV. sec. 2. par. 2. no 4; Worship and Love of God, 14; Principia Part III. Chap. XII. Preface to work on Copper, p. 379.

[208]See D. L. W. 420, 423. Chemistry, Chap. XIV. sec. 3; sec. 2. par. 2. no. 6; A K. 406. notes d. e.

THE FORMATIVE SUBSTANCE OF THE VEGETABLE KINGDOM. The primitive globules of the ether-oils or spirits, the ramental-laden volumes and bullæ of ether, thus rising from the depths of the sea, and collecting on its surface, present in very form the first union of the bullæ of the ether, as an active, with the first passive particles or angular forms of the earth.[209] Such forms are the lowest in the series of the three formative substances of the degrees of the organic individuals, i. e., the vegetative.[210] For the ether bullæ thus surrounded and encrusted by the primal ramental fragments, literally constitute the life-formative, the cosmic seminal principle of the vegetative kingdom, and of the insect and cold-blooded species of the animal kingdom.[211]

This first crust, almost liquid, delicately jelly-like, —an oily visco-fluid foam superinduced over the surface of the warm quiet sea,—was formed then of bullæ of the ether, the atmosphere of the third order, encrusted and clothed about with the finest passive angular particles, the curving ramental edges of the

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[209]Worship and Love of God, 20 note, 25 note.

[210]E. A. K., part II. 355. Ath. Creed. pages 8. 39. E. A. K., part I. 76. A. E. 1208. Worship and Love of God, 20. 25. Corpuscular Philosophy.

[211]E. A. K. part II. 355. Corpuscular Philosophy; Worship and Love of God, 20, 25.

primitive broken salts: these ramental edges being broken away, in the depth of the sea, in the throb and slide of its motion over the rock-salt bed: and as the solid planet and liquid ocean revolve, it lifted and dissolved layer after layer of the great salt stratum formed in its depths.

THE FIRST SEED-SOIL. We are to think of this delicate crust, then, as the first ground of the earth. We are to think that all its masses or "clods" of ramental encrusted bullæ were so many masses of the little active elastic globules, each embodying a minute volume of primal aura, enveloped in fourth finites,—encrusted with ramental angular particles,—and capable of acting as the very formative substance of individuals, actively ultimating the vegetative and lower animal degrees of life. These fine bullæ, thus clothed upon, or encrusted with such ramental particles, were as little seeds, or ova. Under touch of the celestial power and life which they clothed about, as soon as the heat of the sun gave expansion to their delicate surfaces they were able to combine, and as a very vegetative soul or principle, gathering to themselves waters and salts, to initiate the primordial germinations, in simple individuals, of the vegetative and animalculate life.

Thus the first crust collecting over the warm primal salt sea, the first ground formed, was com-

posed as it were of such little bullular ova, involving the very vital formatives of the vegetable life, and was as it were a soil of pure seed.

Corroborative Evidences. In corroboration of Swedenborg's teaching as to the first great basic belt of rock-salt, formed at the bottom of the primal ocean surrounding the earth, and the origin of the first oils or hydro-carbons in the primal ocean, from the dissolution and breaking up of the salt particles of the upper layers of that stratum, under the wash of the sea, the following may be of interest.

The great mountains of salt, and the beds of rock-salt of the salt mines, are for the most part remnants of that great first bed of rock-salt formed in the depth of the primeval sea, the undissolved remnants being in later ages covered over and preserved by deposited strata of other matter.[212]

Now, as it happened at the first age of the earth, swiftly under the solvent action of the water, that the delicate ramental particles were detached from the fine cubes and triangles, and, adjoining themselves to the bullæ or bubbles of the ether, gave origin to the first forms of oils or hydro-carbons; so later it happened, and happens still, in the rock-salt

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[212]Chemistry, Chap. I. sec. 1. 2. 5. 8; Chap. XI. sec. 10 postscript.

mines, but more slowly. And the action of this primal production of the oils is being paralleled in the buried rock-salt beds, but on a smaller scale, and more slowly. Ramental particles are detached by slow attrition, escape and attach themselves to the adjacent bullæ of the ether, both singly and in little volumes, until stores of such loaded bullæ, the hydro-carbons or oils of the mineral kingdom, are formed in the dark caverns and strata of the earth and accumulate in great pockets or wells among the adjacent pervious strata. Bitumen, asphalt, naptha, petroleum, are instances of such forms thus produced.[213]

This accounts for the fact, of so much interest to practical men, that inflammable gas is usually found in connection with beds of rock-salt. In a great salt mine in China, as well as in salt deposits in Hungary, gas is obtained directly from the beds of rock-salt. (Encyclopædia Britannica, article on Gas.)

Moreover the Encyclopædia Britannica, article on rock-salt, notes that "the frequent association of bitumen and petroleum, with rock-salt and brine, is one of the most notable features in the geology of those substances; and seems to point to some un-

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[213]Chemistry, Chap. XIV. sec. 8.

known condition of the formation of the two first named."

Growth of the Earth-Crust. Thus the earth surrounds itself with water, and afterwards with a fertile crust, a crust which in a state of resolution not only yields seeds, but unfolds them into different kinds of fruits and plants.[214] Surrounded with water without a shore, a crust was superinduced, and all that we now find in the vegetable and mineral worlds was enabled to enter the crust. This crust was formed upon the waters by the dissolution of the parts in the water, and the interjections of finites, which emerged to the surface; and the crust continually increased by the addition of parts one under another.[215]

Protoplasm. At first the earth was as yet not earth, but surrounded by an uncovered wave, in a continual bubbling and effervescence from its bottom; presently the uncovered wave of the sea began to be covered by a coat, delicate and without density; but it became dense as it was increased by the affluence of particles emerging from beneath, until it was covered with a surface crust of small eggs or vesicular seeds of the future triple kingdom, each to come

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[214] Principia, part III. Chap. IX. par. 1.

[215] Principia, part III. Chap. XII.

forth successively.[216] Everywhere there was as it were something living in what was not living, or animate in what was not animate, which at length unfolded and opened itself.[217] The first things produced in and from this warm slime of the sea, foamy, pure and tender, were the vegetative life and the complementary forms of the lower animalculate life. For this production only three things were necessary:—

(1.) The finest yet primal oil globules, formed of bubbles of the ether, with the finest ramental angular particles of the earth's first salts, adjoined to them as by a marriage; the two being related as the soul and its body, or as the active center or internal of the sun, to its superinduced crustal body.

(2.) Angular particles, salts, acids and alkalies, with their concave sides, to act as conjunctives.

(3.) Water molecules, greater and less.

Where these are, with fostering heat from the natural sun, with inflowing determinants from the Sun of life, they may at once be framed into the palpitant jelly-like mass, that vesicular or foam-structure, the protoplasm which is the physiological basis of the embryonic life, vegetable or animal.

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[216]Worship and Love of God, 12-15; D. L. W., 311-312

[217]Worship and Love of God, 24.

THE LIFE-FORMATIVE FUNCTIONS OF THE ETHER. Of these three factors, the soul force is in the globules of the oil forms. For the life-formative, the seminal principle, is in the ether, the third degree of the Divine Proceeding, formed into atmosphere, or Use; and each globule of the oil has a nuclear volume of this ether. "The first generating or plastic force innate in the seeds of vegetable fœtuses may be likened to a soul. Such genitures are from the conjunctive of the active forms constituting ether, with the inert powers of earth."[218] That it is the ether of the third order which is the life-formative of the vegetable forms, see E. A. K., part II, 355; and also of the insect and lower animal life, see Corpuscular Philosophy and the previous references to the Worship and Love of God. But the second aura, or the ether of the second order, is the life-formative of the higher animal forms.[219]. And the first or universal aura gives the human life-formative.[220] That such is the highest office in the universe, the living office of the atmospheres, which are the Proceeding Divine, as to Use, see the work on the Athanasian Creed, n. 26, 191.

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[218]Worship and Love of God, 20.

[219]E. A. K., part II. 338, 339. Corpuscular Philosophy

[220]E. A. K., part II. 339. 350. 352. Corpuscular Philosophy.

That this function, this power of the atmospheres, is an arcanum hitherto unknown; and that it is an essential of atmosphere,—not only the spiritual atmosphere, but the natural,—is noted in the Ath. Creed, n. 26; where the birth of insect forms, and the origin of the vegetative form is referred to the natural or terrestrial ether. To the ether as the vegetative soul, the Apocalypse Explained, n.1208, adds its testimonies. From it is the form of plants, and the building powers of coralline forms.

Even the inert substances adjoined, the earths, the salts, the waters, have the urgency toward their uses, springing from like affections and conjoining with the active forces, to bring forth the mutual offspring of use or concrete structural forms.[221] For the series of finiting, beginning in the Spiritual Sun, does not cease until in its last term, the quiescent matters of the terraqueous globe,[222] in which its efforts are all gathered up.[223] Hence in the ultimates of active forces, or the ether, and of passive forces, or angular particles, the creative power of the Lord acts in fullness and strength.[224] This is the first sphere of all, the sphere of these inert parti-

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[221]A. E. 1210. D. L. W. 310. T. C. R. 470.

[222]T. C. R. 33.

[223]D. L. W. 310.

[224]A. E. 1087.

cles, given off by the salt of the sea and married with the ether in the production of the formative substances, or active seminal principles of vegetative life.[225]

As for the third ether itself, the nuclear principle of its own bullæ is a vo'ume of the primal or celestial aura, which regards the Sun of Life alone. It is the celestial-natural degree of the Proceeding Divine, from which exists the conatus and actuality, in the forming force of vegetable life.[226]

Salt as the Conjunctive of Oil and Water. Angular particles, or salts, act as the intermediates or connectives of the higher oil forms, and the lower water forms. Albumen, blood, milk, are given as instances of this conjunctive action of salts, in framing substances into forms plastically co-active with the productive and operative forces of animal life.[227]

The type of reactive substances of materia arising from the coalescence of oils and "spirits" with water, by means of the first salts, are noted as characteristic of the vegetable as well as of the animal kingdoms in E. A. K., part I, 75. The Corpuscular Philosophy notes that the whole vegetable kingdom

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[225]T. C. R. 499.

[226]T. C. R. 308.

[227]Chemistry, part XIV. sec. 4 (4). sec. 8.

is as it were formed of the little bullæ of different kinds, or vesicles less and greater, determined by the enclosed ether, together with the surrounding salts. Revelation itself confirms this great testimony as to the conjunctive power of salt, which, it is stated in the Arcana Cœlestia, n. 10300, "conjoins water and oil, which otherwise are not conjoined." In support of such a derivation of the basic bullular or foam-structure of the protoplasmic materia of forms capable of co-acting with life, that is, their derivation from oil, salt, and water, Butschli's famous work has come with triumphant emphasis. The first successful experiments, given in his work on Protoplasm and Microscopic Foams, were made from a bottle of olive oil that had long stood in the sun, and common salt finely ground, and water.[228]

For the wonderful work done with such foams, the interested reader is referred to the original volume. Here the quotation is adduced as a modern instance of what the Writings say as to the powers of salts to act as a conjunctive between water and oil; and an experimental confirmation of Swedenborg's statement that the structural result of such conjunctive action is the production of vesicles, bullæ, or alveoli; which foam-type is given as characteristic of the

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[228] Protoplasm, etc., pp. 7-17, by O. Butschli, Trans. 1894. Adam and Chas. Black.

structure of the minutest plastic particles, vegetative or otherwise, in which the life-formative immediately clothes itself about, and acts. To the confirmation of this, Andrews' study on the Living Substance gives emphatic testimony, as follows, "The structure of protoplasm, throughout the substance of all living organisms examined, except when secondarily altered, was found to be, as maintained by Butschli, that of a visco-fluid foam."

For the origin of living functionating units or forms, giving out characteristic spheres,—that is, for the bringing into existence of the reacting foam-structure, jelly-like, plastic, namely, the protoplasm of the simplest outermost forms of vegetative life, and of the animal life which is confined to the vegetative or third ether plane,—nothing is needed but the presence of water and salt particles, and the primitive ethereal oils, moving under the determination of the celestial sphere in the ether itself, with its first produced vesicles brooded and warmed by long sunshine, in a moist pressing atmosphere.

Rise of Animalculate Life. The first living form to open, to be born in and from this warm slime of the sea, pure, tender, was the simplest, lowest vegetative life, and the complex lower forms of animalculate life, which swim and fly, "fœtuses which performed the exercises and offices of their

life in a state of greater ignorance than other creatures," as befits the outmost life-formative, bodied in organs without basis of self-respective reflux.[229]

In the shaded depths of the sea, where the ether-bubbles, tangled in, did not rise, or did not rise far, their plastic force, as a seminal principle, coacting with homogenous exhalations of particles from below, framed the living forms of the deep sea ooze, the Foraminifera, whose little day of life is given to secreting into and about their tender bodies firmer matters, and delicate shells. When their own day of life is over, the fine shells they lived into being, stay. And of the accumulations of myriad generations of such, our basic limestones, even our basic siliceous formations, are posited.[230] Indications remain still of the old source which Swedenborg postulates for the origin of such forms, and the conditions of salts, and ramental or carbonacious particles in their life environment. "Limestones often contain so large a proportion of bituminous matter, as to give off a distinct odor of petroleum when struck with a hammer."[231]

Later, the larger creatures, the scarcely living

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[229]Worship and Love of God. 18. 25.

[230]Physical Geology, by S. H. Green, Chap. 4. sec. II.

[231]Rocks, Rock Weathering, and Soils, by G. P. Merrill, page 145.

corals, set their tiny rock-bound bodies as steps for successive generations to climb by, to upper levels of island ring and reef. But over all the smooth wonder of the crustal covering of the sea, the living foam, the outputs of the seeking root, and the tinging leaf, began to be. Thus the first vegetative protoplasm took its rise in and from the purely jelly-like crustings of the primal sea, where the globules of ether-oil, the salts, the tangled mass of finites, the water particles, all, as they outwardly were warmed softly by the sun shining through the mists, were inwardly touched to living action by the celestial aura, imminent in every particle of ether-foam. And to this first source and conditionment of the spontaneous generation of primal forms of vegetative and animalculate life, the conditions under which the hell-broods of evil insect forms and evil animalculæ came first and do still come to spontaneous generation, give the testimony of their mimicry. For they originated in "stagnant lakes, marshes, rank and fetid bodies."[232] And the plastic force of nature flowing into the ethers, acts to originate forms, everywhere and anywhere, "whenever homogenous exhalations are present in nature."[233]

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[232]A. E. 1201.

[233]A. E. 1208, 1201.

## CHAPTER VI.

## THE FIRST VEGETATIVE FORMATION, AND ITS LIVING SERVICE IN PREPARING AN ATMOSPHERE FOR BREATHING CREATURES.

THE DIVINE IN ULTIMATES. The floating ground upon the primeval sea was the first ultimate ground in which the Lord the Creator began to shape large organic forms of use, or integral recipients; for from the ultimate ground and out of it, the Lord raises up recipient, reactive forms, and quickens bodies of use; and this He can do because in the soils and ultimates of the waters and basic salts of very earth the Divine Proceeding, through the spiritual, exists in termination. And in that termination all its conatus and endeavor is to return and again be conjoined more consciously and more nearly with the Infinite, its Source.[234]

Moreover, this first ultimate and ground, spread evenly upon the surface of the sea, was an especial ground, as it were all seed. For according to Swe-

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[234]D. L. W. 171, 310, 314. T. C. R. 470. A. E. 1209, 1210, 1223

denborg's laws of forms and their powers, the constitution of oils and formative fluids, the very floating crust of hydro-carbons collecting over the primal sea, presents the first actual union between the volumes of the ether and the finest particles broken from the compressed angular forms of the terraqueous salts. Thus this primal ground was itself everywhere, in its degree, apt for the reception of life and beginning of motion; and under the touch of the Divine hand, delicately touching within, and the warm sun conspiring without, its fine globules were everywhere able to act the part of a formative substance and very seed of vegetative forms, in their place and degree reactive to life.

Thus of these primeval ethereal oils and water, with the salts of the sea to serve as conjunctives, the Lord Himself acting through the medium of the ether existent in each oil bubble, framed the first coarser basic corporeal foams; throbbing, moving; obeying life; in which all the typical forms of the creative series, passive as well as active, were simultaneously existent.

In this manner on the warm sea were brought into existence the first forms of the protoplasmic foams: vegetative, simple, full of potencies. The ether within acted as a soul, a father, and stamped its own foam likeness, and its own recipience and

obedience to the Divine influx, upon the forms thus builded. The salts of the earth, its basic angular forms, lent mother body and form; and as passives, bounded active forms, gave them terminus, corporated their determinations and excited their activities in determinate and rhythmic motions.* In each such least pin-point form, composed of such subtle basic protoplastic foams, the gracious moulding ether gathered up a million particles of earth, ramental particles and salts and molecules of water a million millions; and all those millions of particles, in themselves all scattered, sundered, self-helpless for all their evolving conatus within them, the ether swung and arranged into one vegetative form, concrete, integral, after its kind receptive of and coactive with the Infinite Esse. Moreover having builded those scattered particles into such a form, the same flowing ether, which had been the formative substance, still held them together,

*Throughout nature the passive is associated with the active, and this in order that the passive may break and limit the forces of the active body; otherwise powers would not be bounded and would have no sphere . (A. K. 491.) The agent does not know its terminus except by its own reagent, by which it is determined into definite motions and thus into alternations of motions. (Diseases of the Fibers, 395.)

through all their little day of use. For to create is not only to form, but to hold together afterward as well.

First Vegetative Forms.. Then first vegetative growths began, soft roots went down. Frail watery leaf spread out. Millions of successive generations were formed and died. Upon the cumulative soil of the bodies of the past vegetative lives, the springing new generations shaped with firmer fibre and stem and higher growths. As the soil grew deeper, its resources of primitives of concrete angular forms grew more varied and of firmer, more individual cast. For each new generation of the vegetative progeny builded into its very body *not alone the primal elements simple and few, of which the first bare vegetative foams were framed,* but all the *dejecta membra* of the parent bodies of past years' growth, were taken, inbuilded as new inert particles and forms serviceable to constitute the firmer fibre of ascending and differentiated vegetative forms. Thus the vegetative kingdom itself, as it were, ascended and unfolded from simplest beginnings of vegetative foams reactant and quick to life, to multiplex and widely differentiated forms; and this quickly and sweepingly in the gracious even heat and nourishing moisture of those primal seasons.

Few and simple were the primitives of inert par-

ticles the primal sea could give for the first organic building; comparatively simple and undifferentiated the vegetative forms possible to be framed from them. But once let these simple vegetative bodies or forms begin to coact to life, and each one becomes as a new world, the matrix and creatrix of new forms; a new world of working use, to prepare from the old material new and varied store. Each least vegetative form takes the old salts of the sea, and carves them into new and divided forms. The growths riot hither and thither, in the accidents of their existence. The bodies of vegetation grow firmer and firmer, and death comes to seal their basic use. "Chiefly by the aid of the vegetative kingdom," the *Corpuscular Philosophy* says, there are formed at last marvelous varieties of new fragments, inert, like some new species of angular particles, no two of the infinite number quite alike. Thus there is brought into existence, as it were, a new, a second, earth or soil, brought forth upon the primal earth and from it, by means of the vital energy and happy accidents of the individuals of the primal vegetative kingdom. This use of providing a store of finer and more varied shapes and powers of inert particles is so important to all formation, that, *without it*, there could never upon the earth be formed bodies of more differentiated and varied

receptivity than those of the first foam-cells of the warm sea, nor could animal bodies, of higher differentiation and life than the amoebic, ever arise; nor men ever appear. For to the body of their formation is necessary not only the existence of the kingdoms proceeding; but the cumulative result in varied store of concrete angular particles and spheres of diverse substance and form collected during long generations of the life and death of those kingdoms; so great, so microcosmic a variety, of such ultimate form, is necessary to frame this cunning and universal organic form of the human creature. For the human form must be a microcosmic form, even in respect to those angular particles, if it is to image, coact with, and ultimately receive as an organic foothold the fulness of the outgoing creative and formative life of our Lord, so that it may be the living tabernacle, corporeal, quick, of the Divine Human. Uses, so high in life, so deep to religion, are involved in the ultimates of the earth and the sea.

Thus the dissolution of plants contributes to the mineral kingdom; all as it were goes to form a new, more plastic and varied mineral kingdom. For the third "form of use" stored in the treasure house of the mineral kingdom, (what we call inorganic chemistry), *"arises from plants fallen to dust,* and

from the remains of animals, and the continual evaporations and exhalations of them which mix with earths and form the soil."[235]

Thus the life and death of the successive generations of the vegetative forms contribute to the possibility of an ascending evolution of successively more differentiated and complex forms upon the earth; and are absolutely necessary to the bringing into existence the forms of animal nature, with indefinitely great range of variety.[236]

But there is something more important still; two uses of the vegetative kingdom as yet not touched upon. Every unit of organic form, every individual,—beginning with every smallest simplest integral individual of the vegetative kingdom, although it be framed of billions of particles of basic salts, inert fragments and watery molecules,—yet is builded and held together by the ether, in an integrity emulous of the Unity of the Divine Esse. Hence it gets its emulous title of individual. While it remains integral or individual, as such it is given in itself an interior circulation, emulous of the reflexing circle in God Man. As such it is given emulous creative or protoplasmic powers, powers of

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[235]D. L. W. 313.

[236]D L. W. 318; Worship and Love of God, 20.

forming a forthgoing volatile sphere or emanation "consubstantiate" with itself; objectized to itself; and always lending itself aptly to a recreation of such a spiritual form as that of which it was primarily part. This latter power is its passive analogue and potency complementary to the active power and endeavor of the primitives of the spiritual Sun, always to form man, because primarily consubstantiate with God Man, the sole Substance or Esse, and proceeding as an emanation or sphere from Him.

The Preparation of an Atmosphere for Breathing. The endeavor hidden in the outgoing emanations of the latter type, in the vegetative kingdom,—that is an emanation of the fragrant essences and oils, volatile, ethereal saps, spirits, and sweet odors, especially abundant when the vegetative kingdom has risen to the grace and productive dignity of flowers and fruits,—comes to sweet evolution of use, in the impregnated air around. For from the substantial particles of such fragrant odors and essences given off from flowers and herbs into the ambient air, the plastic ether first produced insect forms; thus arose in nature the province of insects, varied in color as the mother petals which sent their sweet bodies odorously forth for that ascending use; breathing thus the longing of the very substance of

the vegetable body to arise to animate and more self-conscious form in its use and recipiency of life; and such is the story which the Writings tell of the origin of insect forms, in the intrinsic conatus of the very substance of the vegetable plane towards fuller, more distinct reception of the animations of life. For as there is a continual endeavor of the minerals of the earth towards vegetation,[237] so everywhere there is an effort of the very substance of the vegetable growths toward vivification.[238] In both cases this ascending use to higher degrees of form and life, these uses by which their very bodies prepare and contribute themselves to become integral part of a higher degree of organic recipiency of life, is by means of their spheres, their emanations.[239]

This is the sacred use of the flowers and fruits and the perfumes of the vegetable forms; their Sabbath day use to the animate kingdom. In this they give forth the sphere of their purifications and their fructifications to the ether around; and of that sphere the living Lord, acting in that ether, moulds the bodies of the insect world, loving the flowers as their honey-nursing mothers still.

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[237] D. L. W. 61-65.

[238] D. L. W. 62.

[239] T. C. R. 499, 585, 470. Treatise on Copper, Preface. D. L. W. 310.

But there is an every day use performed through the common green leaves of plants, in which the whole of vegetation daily prepares and provides for the great kingdom of the larger lung-breathing animals,—a use so important that when we know it we understand why the vegetable kingdom had to exist before the world was ready for the animal kingdom of creatures with red blood and opened imperative lung-life. For the same kingdom, which, Swedenborg says, breathes forth daily into the atmospheres that aerial salt, that atmospheric salt which in the lungs changes the venous blood to arterial, must be that kingdom which first provides the store thereof, in preparation for the advent of the lung-breathing, red-blood forms of life.

The Aerial Salt. There is a certain "salt," Swedenborg says, consisting of angular particles, which exists dissolved in the interstices between the bullæ of the fourth aura (the aerial elementary), just as the sea-salt exists dissolved in the interstices between the round molecules of water. This salt Swedenborg calls the volatile aereal salt. It constitutes the common aliment which the lungs supply to the blood. It is in fact the supply of this salt that changes the venous blood into arterial blood, during its passage through the lungs. This volatile aereal salt consists of tetrahedral particles,

and is, therefore, an "acid salt," according to Swedenborg's doctrine of forms. It belongs, moreover, to the same family of substance as sulphur. Lacking this salt the globules of the animal spirit cannot combine to compound the red blood. For although some other substance always furnishes the central cubic connective, it is the particles of this tetrahedral aereal salt alone which normally infills all the many corner interstices of triangular form, still left after the central cubic grouping.[240]

This volatile aerial salt is exhaled by the vegetable kingdom from the grosser salts and compounds upon which the roots feed. The salts or mother stuff with which the current of the sap is impregnated, (that sap or vegetative blood in which the formative fluid of vegetation is present), takes what it wants of those compounds, sundering and recombining; while the watery vegetative blood climbs the woody fibre to the cells of the leaves; in these cells, as with the serum of the blood in the lungs, it exhales a dewy breath, carrying with it all the inert particles of the original compound salts which are superfluous to its needs; the sap current then returns by other fibrous ways to its ultimate cellular buildings.

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[240] A. K. 406, 485; E. A. K. part I, 50-100, 596. Post. Tracts, Red Blood, chap. IV and V.

These superfluous salts thus sublimated from the basic compounds of the plant food in the current of the vegetative blood, and exhaled along with watery vapor from the surface of the leaves, are said to be the very volatile aerial salts with which all the lower atmosphere or aura of the earths is impregnated; the same salt which in the lungs changes the venous blood into arterial.[241]

To sum up: this "salt,"—volatile, atmospheric, dissolved in impalpable space, as sea salt in solution is dissolved in water: this salt-acid of the sulphur family: this salt which is drawn into the lungs at every inspiration and to which is due the change of venous blood into arterial during its passage through the lungs: this "salt" sublimed from its food stuffs by every vegetative growth and continually exhaled from every leaf into the surrounding space, along with the transpiring current of water which breaths forth from the leafy lung, when the sunlight opens its exspiratory pores;—this salt, by all its bond and chain of uses, is the atmospheric gas which we call oxygen.

THIS SALT IS IDENTICAL WITH OXYGEN. For the gas oxygen is dissolved in the apparent impal-

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[241] T. C. R. 470, 585; A. E. 1084; D. L. W. 313; Principia, part III, chap. IX, 4; Documents, 302, On Odours; A. K. 406, 485; E. A. K. Part I, 596.

pable space, as salts in solution are dissolved in water. Oxygen belongs to the acid end of the periodic system of chemical elements; it is of the same family or genus as sulphur,—the sixth family of the periodic system being headed by oxygen and sulphur. The gas oxygen is the common aliment which the lungs supply to the blood: and to the gas oxygen, which the venous blood imbibes during its passage through the lungs, is due its changes into arterial blood. Moreover, the leaves of the vegetable kingdom, under the touch of sunlight, when their transpiration current is flowing freely, do perpetually exhale oxygen into the air round about, from every little pore.

In this derivation of the gas oxygen, (Swedenborg's volatile aerial salt),—by sublimation from the salts of the earth and water, through the instrumentality of the vegetable kingdom, the volatile aereal salt being formed by the divided salts in the plant food, superfluous to its uses,—there are three essential things new to our knowledge. *First*, the uses it subserves to the blood of a higher kingdom while composing itself into an entity or blood of a more ultimate degree. This use is new, indeed, to our knowledge. For it is Swedenborg alone who is able to tell us how a lower degree of substance can be compounded out of a higher; just

what factors are needed; and where they come from. Something of the great doctrine of intermediates is involved here, and the *Benjamin* laws of composition. But of such things experimental science cannot teach us; only the laws of forms, and the constitution of degrees can teach us. *Second,* The derivation of this superfluous volatile salt thus exhaled, chiefly from the grosser non-compounded food-salts imbided by the roots, by a process of division and sublimation. *Third,* The surety under the law that the series of existence and continuance is always the same as that of formation and beginning,—that if the activity of the vegetable kingdom perpetually performs this use to the atmosphere, it performed it in the first place. And therefore that all our stock of atmospheric oxygen, without which red-blooded breathing creatures cannot exist, was first prepared for the world by the activity of that same kingdom. This is the great common service or use performed by the vegetable kingdom to creation, preparatory for the existence of breathing creatures.

An interior view of the first point is given by Swedenborg only. But to the second and third points of this new knowledge, experimental data have, within a lifetime, afforded happiest illustrations. Phipson's series of experiments with grow-

ing plants are decisive upon the subject. According to the result of those experiments, when plants are grown under a bell glass in an atmosphere of pure nitrogen, (or pure hydrogen), *the root being supplied with earth, carbonic acid, and water,* the plants thrive; they absorb water and carbon compounds from the roots, and secrete *oxygen* from the leaves, *until the atmosphere* under the bell glass is rendered by this means alone *richer in oxygen than the surrounding outside air.* The carbonic acid ($CO_2$) is not directly decomposed into carbon and oxygen. From the $CO_2$ plus water ($H_2O$) are formed various sugars, starches, cellulose, fatty acids, and the like; and the superfluous oxygen thus liberated is exhaled through the leaves into the air.[242]

Moreover, from conclusions reached on the basis of experiments with microscopic plants abounding in rain water and other water exposed to the action of sunlight, it would seem that plants of the simplest order evolve oxygen more copiously, weight for weight, than plants of the higher orders; and

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[242]Articles by Dr. T. L. Phipson, F. C. S., "Chemical News," 1893, March, June, August, November; 1894, November; Principia, part III, chap. IX, 4; T. C. R. 470; Corpuscular Philosophy; Documents, 302, On Odours, sec. I.

the deduction is made from these experiments that the primitive atmosphere of the earth did not contain oxygen gas, and that the vegetable kingdom was certainly the means, and the sufficient means, whereby oxygen gas was placed in the atmospheric volume; with the manifest further conclusion that therefore vegetable life must have preceded animal life upon the earth; and that a main office of the growing plants of that primal vegetable kingdom was this gradual excretion of oxygen gas (the volatile aerial salt of Swedenborg's), into the atmospheric volume, preparatory for the advent of breathing animal life.

## CHAPTER VII.

## A CHAPTER IN GEOLOGY.

Rise of the Floating Vegetative Land. The primordial sea bubbling from its depth was the mother of primal chemical elements and combinations; the crystalline liquor of all rocks, the chyme of all organisms.[243] In its deeps above the primal rock salt layer, the newly dissolving salt gave the ramental particles for the first hydro-carbons of the world formation; which, as a very chyle and milk of vegetative births ascended continually through the sea to its surface in bubbling, organizing, oily foams. All along its ascending path, if anywhere detained, there began to shape the new born masses and filaments of vegetative formation, close to the borders of the inorganic.[244] On the surface of the sea the collecting layer of the oily ether foams, under the heat of the brooding sun, panted and pal-

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[243]Chemistry. chap. on Primeval Ocean. par. 5. (6) par. 8; chap. X. sec. 2. (5) 4. (4); chap. XI. sec. 5. par. 2. (2); chap. XIII. sec. 12; chap. XIV. sec. 8. 5. (2).

[244]Worship and Love of God. chap. I. 14. 15; Principia. part III. chap. XII; Preface to Treatise on Copper. par. 5. 7.

pitated in all its bubbles to the rhythms of light and heat; and at each expansion the Living Infinite within and around, acted with enlarged scope,[245] to touch, order, and hold together the microscopic bubbles of the floating foams into forms of simplest vegetative use. Thus the first low vegetative organisms took form, ramified, matted together; and from this beginning grew the vast floating islands, continent wide, of interknit vegetable growths. For age after age, so long as the continually dissolving salt of the crystalline bed of the ocean fed them with streams of fresh carbonaceous aliment from below, they would continue to grow, until, Swedenborg says, a floating vegetative land, a mile in thickness, covered over the surface of the breeding sea, like a great crust; then, grown almost too heavy to sus-

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[245]The animatory motion of heat, in these microscopic foams, and its necessary and conjunctive action, with the Living Infinite in the production of vitally organized forms, in and from the foam structure, is paralleled by the necessary operation of the brooding heat upon the egg. It is said by Swedenborg that the living point of the seed cannot actuate the substance of the egg to ordinate it into organic form until warmth has already excited "a certain species of activity" in its molecules or particles; for only as they are in such a state of excited activity, are they "prepared and obeisant to the living activity." E. A. K. part. I. 308.

tain itself longer, it settled, submerging, breaking toward collapse and subsidence to the ocean bed.[246] Thus, on the surface of the sea, in that early epoch, the immense vegetative growth of the carboniferous layers of geological record, began to exist, were nourished from below, and at length submerged, and, thus were preserved for the use of after ages.

First appearance of the Nitrogen Family or the Ammonias and the Phosphates originating in the Primordial Sea. The bubbling streams of displaced ether, encompassed and coated by ramental fragments from the newly dissolving salt in the depths of the ocean bed, presents the generation and actual making of the first hydrocarbons for the use of the nascent world and almost its whole future store of carbon. In addition, along with those ascending streams of hydro-carbons there would seem necessarily to have been intermingled also the first nitrogen compounds, probably in the form of ammonium compounds, and also the first forms of phosphorus; thus the primal ocean would itself supply the first members of the nitrogen-phosphorus family of the periodic system. For, according to

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[246]Worship and Love of God. 20. 21; Preface to the Treatise On Copper. par. 5. 7. Chemistry. Chapters on formation of rock salt strata, *in situ,* in the bottom of the sea; and on the constitution and origin of oils.

Swedenborg, the inner constitution of the nitrogen compounds closely pattern that of the hydro-carbons or oils. It also presents a volume of ether enclosed and crusted around with angular particles derived from dissolving salts. Only, in the case of the nitrogens, such particles are not ramental, or scale-like fragments, but are of the finest triangular form.[247] Such finest trigons would result abundantly in the depths of the primal ocean, both by the comminution of the large triangular acid particles through the action of vegetation or otherwise; as also by a breaking off of the sharp triangular corners of the ramental particles. Thus the simple nitrogen compounds, (probably of ammonium), would certainly seem to have had their primal generation and start in the depths of the sea, for certain ammonium compounds are classed with the mineral oils in the chapter on the constitutional form of oils and spirits.[248] And the motion of the waves of the sea emitting phosphoric light from the breaking up of the finest invisible particles of salt in solution,

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[247]Chemistry. XIII. sec. 1. sec. 2. (1). Worship and Love of God. chap. I. note 22.

[248]Chemistry. chap. XIV. sec. 2. sec. 8. 2. Among the mixtures of salt and water with the primal mineral oils originating in the deep sea Sal Ammoniac is directly mentioned.

would seem to indicate the sea as the primal source also of the primitives of phosphorus.

The simple nitrogen compounds thus arising would furnish the supply of nitrogen necessary as the mother stuff, to compound the flesh and substance of forms of animate life all through the sea; and the ascending current would, together with the carbons, year after year, continue to supply streams of fresh nutriment, like streams of new blood, to the roots of the floating vegetative world above it. All such particles not actually detained and used by the growing vegetation, would finally arise higher, into the elementary realm above the vegetative crust, and by the breaking of the carrier bubbles, vapor like, be dispersed into the interstices of the bullæ of the surrounding ether volume,—there to add their quota to the collecting store of the atmospheric nitrogen, slowly accumulating through the ages from sundry sources. For the sources of origin of nitrogen are more than one, the two chief sources being, first, the stores of the primal sea, and second, the play of lightning, tearing the ether bullæ with its darts, and casting down the disrupted envelopes, as a loose contexture of fourth finites.[249]

[249] Principia, part III. chap. VIII. 15. Compare spectrum of Lightning identified by Landaur as presenting the characteristic line of nitrogen.

Thus not only was the primal ocean a great cosmic source of nitrogen; but each flash of lightning in the sky actually begets a new volume of it into the air. Indeed the soil itself is now nourished by such new heaven-born particles caught on vapor bullæ and descending to the earth in showers,[250] as, primally, at the epoch of greatest vegetative growth, it was nourished from the depths of the ocean, upon the bosom of which it was afloat.

SILICON AND CARBON, TWIN SUBSTANCES, OF ONE FAMILY, TYPE, AND ORIGIN. The first carbon created in the nascent world made its appearance not as pure separate elemental carbon, but in the form of a compound,—the mineral hydro-carbons originating in the deep sea,—their constitution presenting to Swedenborg the structure-type characterizing "oils and spirits," namely, bullæ or bubbles consisting interiorly of a minute volume of ether, enveloped and enclosed by ramental or curving wing-like fragments broken from the edges of the primordial crystalline "salts,"—like ramental fragments enveloping bullæ of water vapor apparently forming carbonic acid.[251] Now there exists strong ground to class silicon directly with carbon as possessing a

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[250]Chemistry, chap. XIII. sec. 2. *a posteriori* (2); E. A. K. part. I. nos. 75. 76.

[251]Chemistry. chap. XIV. sec. 2. 3.

like structure-type; their place and time of origin being one, and the production of both taking place by means of the ramental particles of the newly dissolving salts; silicon as well as carbon being first evolved in the nascent world not as a pure element, but in the form of a compound—the colloidal hydrate of silicon. The chief distinction between the primal carbon and the silicon compounds would be that the ramental fragments appropriated to the hydrate of silicon were broken off from the heavier thicker side of the original curving wing-like ramenta, the more delicate lighter edges being appropriated to the constitution of the hydro-carbon bullæ.[252]

Silicon is one of the most abundant chemical elements in the earth's crust, being largely constitutive of all rocks produced by aqueo-thermal metamorphosis of the silicious oozes and sediments originally posited on the deep sea bottom,—such as our gran-

[252]In Swedenborg's system the chemical elements *per se* were not first generated, and then compounded. On the contrary, all the chemical elements appear on the creative scene first, in the shape of compounds. Their separation and more complex compounding belong to other agencies, —mostly organic,—and other ages. For instance, oxygen and hydrogen were first brought into existence in their compound,—water. Sodium and chlorine first appeared in the world in the form of their compound, salt, etc.

ites and flints. Silicon is, indeed, a characteristic constituent both of the greater portion of the minerals of sea origin, and of all the vegetative forms which live and grow in the sea, from least to greatest. The glass sponges are a lovely instance of the latter, common to all our museums. In itself, as a chemical substance, silicon has been found to stand in the nearest possible relation to carbon in the periodic system; carbon and silicon being the first two members of the fourth periodic family, silicon carrying the greater atomic weight. Their closeness of constitutive factor and pattern is marked not alone in likeness of chemical reactions and affinities apparent in laboratory experiment, but in obvious physical states and properties; and in a physiological interchangeability in sundry simple forms of vegetative use and life. Like carbon, silicon is easily capable of existing in a colloidal or vitreous state,—gelatine like, plastic and mutable. The colloidal constitution is characteristic of all the plastic elements of organized bodies. Hydrate of silica, as the geysers bring it up from the depths of the earth, is first deposited as an oozy gelatinous substance, like a soft jelly-glass, hardening by time. Moreover mineral forms of silicic acid, such as flint, are known to have passed during the geologic ages of their existence from the vitreous or colloidal into the

crystalline condition. In addition, carbon is directly replaceable by silicon in the case of certain fungi, which grow as well when nourished by fresh colloidal silicon as by carbon.[253] Moreover, spiral fibre masses, Sarcina-like bodies, and fungi, will develop *de novo* in colloidal silica, prepared under conditions which preclude the existence or the entrance of particles of living matter—"germs"—to initiate their growth.[254] Such a thing implies that the very type of molecular aggregation marking the vitreous or colloidal state, such as characterizes both hydrate of silicon and the carbo-hydrates, must itself *per se* be physically an aggregation of least "matrices," or a mass of molecular bullæ, or bubble cells. The envelopes of such bubble-cells like most impalpable shells close around and include small volumes of the ever present active ether, so as to form flexible closed bubbles, capable of reacting plastically and serviceably to the motions and impulsions of the life communicating[255] ever ordinat-

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[253]Bastian's Beginnings of Life. X; Quarterly Journal Micro. Science, 1868, pp. 105-108.

[254]Beginnings of Life. Bastian. X. Quarterly Journal Microscopical Science, 1868. p. 105-108.

[255]Swedenborg's definition of *life is* unique. He defines *life* as a *mode of motion,* of vibration or tremulation, which can be set up and be maintained only by the living Infinite God, and be imparted to created organic forms

ing ether which presents the Divine in Use or Operation. That all substances in the colloidal or vitreous state do actually possess such an interior molecular arrangement and massing into grosser, bullular forms, corresponding to those of the fine bullular ether, (which ether, indeed, probably forms the whole nuclear center of the grosser bullæ), can be directly affirmed. We deduce this from Swedenborg's statement that the state of vitrification itself consists in a transposition of the particles of the substance into bullæ or bubbles, and the conjunction of the same.[256]

Such a bullular or foam-like and plastic interior constitution is characteristic of the oils, both of the mineral oils and the organic oils, the animal spirits and spirituous fluids, (the life-formative fluids) which are as higher oils. Its general type is illustrated in chapter XIV of the Chemistry, and further defined in E. A. K. part I. no. 75, and it is characteristic of all protoplasms.

In the Chemistry, as we have noted, this form is given as first originating in the deep sea, and produced by means of the ramental or wing-like fragments broken from the edges of the fresh dissolv-

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every moment by and in and through the medium of the foam-like ethers or auras.

[256]Miscel. Obser. part. II. on Vitrification.

ing salt. The form of these ramental fragments is slightly curving, a sickle-shaped particle: the concave edge being thin and keen, and the convex edge being markedly thicker. Swedenborg notes that the original ramental fragments have lines of easy fracture; and that by concussion of friction the thinner, lighter portion of the ramental scales is readily separable from the heavier; and that thus arise stores of ramental fragments of differing size and weight.

Now on comparing carbon with silicon as to properties, uses, and localities of most abundant store, the indications would seem to be that the ramental fragments of lighter weight, enveloping about the volumes of displaced ether, or of water vapor, constituted the lighter bullular foams composing the mineral hydro-carbons and carbonic acid, the bubbles of which, being light, ascended easily from the profound depths of the sea to its very surface, along with the ammonia compounds, there to lend their foam mass, palpitant in the warm sun's heat to form the body of the endlessly springing vegetable forms, the vast preserved store of which constitutes the carboniferous strata, the store houses of the primal superabundance of carbon for use of future ages. The heavier ramental fragments derived from the same original ramenta, but by reason of weight not so apt to rise lightly to the surface of the sea, form-

ed with displaced ether bubbles bullæ of like type as the hydro-carbons. All such bullæ, loaded with weightier ramental fragments, probably never were able to rise far out of the zone of their original creation, but there in those sea depths came to analogous uses as the colloidal carbons. For what we term silicon, as has been said, stands in the nearest relation to carbon of any known substance. Its chemical affinities, relations, values, parallel those of carbon, only it is of greater atomic weight. Like carbon it is distinguished in its aptitude, its tendency, to form colloidal or jelly-like solutions and combinations. It is interchangeable with carbon in the growth of certain fungi, and sub-vital organized growths spring *de novo* in its fresh solutions. Moreover, it is present almost as universally and characteristically in submarine vegetation and microscopic and low forms of life as carbon alone is with relation to sub-aerial vegetation. It is indeed so abundant in many rock strata, known to have been primarily posited as sediments on the deep ocean bed, that Le Conte speaks of whole vast classes of minerals as for the most part existing in a sort of magma of the simple fused alkaline silicates. This would be what would naturally follow if the original ramental fragments abundant in the primal sea were rebroken into a lighter and heavier

portion, and the lighter fragments formed bullæ able easily to rise to the surface and found stored for the most part in the carbonaceous remains of vegetative life known to be of sub-aerial growth. But the bullæ formed from the heavier ramental particles remained beneath the surface of the water, and are found stored in the vegetative and other forms of sub-aqueous life. Moreover, silica would be almost invariably characteristic of strata known to have been originally posited in the bed of the sea.

Now we know from Swedenborg that the first evolution of carbon on the earth must have been in the compound form of the mineral hydro-carbons, —and perhaps carbonic acid also—arising from the salt beds in the deeps of the primeval sea. There certainly seems presumptive evidence also, from a connection of Swedenborg's principles with the various facts cited relative to silicon, to conclude that the known evolution of carbon gives us a clue also to the evolution of silicon, its nearest chemical relative. Silicon would seem, therefore, to have been first evolved on earth in its hydrate compound, in the depths of the sea, at the same time that primal carbon compounds were in formation. The heavier edges of the ramental fragments broken from the primal salts bear the same relation in their constitution to the primal silicon compounds, that the lighter

ramental fragments do in the constitution of the allied carbon compounds; and the place of their greatest abundance and use is, naturally, in the water near the place of their origination, as befitted their heavy inaptitude to rise; while the lighter weighted carbon-compound rose to a place of uses where sea and air joined.

EVOLUTION OF THE HALOGENS AND THE ALKALINE AND EARTHY METALS. SWEDENBORG'S INTERPRETATION OF THE SUCCESSION OF EARLY GEOLOGICAL STRATA. The evolution of the halogens and of the alkaline metals has already been given in the history of the formation of the rock salts constituting the compressed crystalline floor of the primal sea. Chlorine, Bromine, Iodine, all the halogen family, made their advent among the few substances of the nascent world, united in compounds with the alkaline and allied metals, in that great basic formation of the salt layers of the depths of the sweet water sea. As the salt dissolved in the water above, and the sea grew salt, the halogens and alkaline metals were dissociated, and the metals, potassium, sodium, calcium, set free, to furnish necessary material not only for the sub-vital growths of corals, but for the shells of lowest, most minute forms of life, such as exist today in the deep sea ooze; and, in the very early ages of geologic record, these accumulated on the floor

of the ocean in such abundance that they prepared material for the present strata of chalk, sometimes a thousand feet thick; while the silicious ooze has left remains in layers of rock, even more abundant.

So far as the history has gone, we have followed the making of the primal unsalted sea, and the sequent evolution of the halogens and the alkaline metals, in the form of their compounds or salts, framed in the depths of the sea from the spherical water particles. In this formation the metallic hydrogen of the water particle was compressed and cast from the spherical into the cubic form, characterizing the alkaline metals, as sodium, potassium, etc., and the spherical oxygen crust of the water particles was pressed and cast into the mould of the triangular particles of the acid halogens; and both, (by aid of the uncrushed particles of the water of crystallization present), were fitted together on the crystalline model. Of such units the great crystalline layer of rock salt was framed as the floor of the sea.

The second epoch, according to Swedenborg's system of substance and world making, was ushered in with the beginning of the solution of the rock salt layer in the sea. In the process of this solution, the units of the alkaline metals and of the halogens which compounded the salt, were dis-

sociated and set free for new combinations and services. The fresh ramental fragments,—thin wing-like, curving scales—were broken from the edges of the angular forms built into the crystalline salt, and, later, were themselves broken. The third ether, displaced from the interstices of the round water particles by the particles of the dissolving salt, ascended through the sea; and around it as it arose, the ramental particles were attracted, gathered and grouped. The lighter ramental particles were lightly borne by the streams of ascending ether to the upper air, together with the lighter triangular fragments broken off; and through all this age we may imagine that the sea bubbled from its very depths with the rising bullæ of the mineral hydro-carbons and carbonic acid intermingled with the simplest ammonical compounds. On the warm surface of the sea this rising material served *life* as a mother or matrix stuff; and of this first union of the ether and the inert particles shaped in the sea, the first vegetative protoplasms took form as the beginnings of a floating land, and stores of carbon. The heavier ramental particles left behind, clinging to and gathering around the like ether bubbles, weighted and detained them in the volume of the sea; and there they also came to their use, as coadjutors of the carbons, in serving the Infinite Life for a

mother matrix and body of simple forms of vegetative and obscure life; and there in the sea depths the remains of such life were chiefly stored, to frame the strata of our rock-bound coasts.

This epoch was long. Its accumulations were on an immense scale. Swedenborg says the floating continents framed of pure vegetation, formed on the surface of the primal sea, attained to the thickness of a mile and formed an immense crust of vegetation and the debris of vegetative growth almost compassing the circuit of the world-enveloping sea.[257] The marine vegetation below the floating crust, and the deposits of silicious and calcareous ooze accumulating from the remains of the minutest vegetative and animate creatures toward the bottom of the sea, must have been of commensurate thickness; to say nothing of the sediment silting down from the upper floating lands.

One thing in Swedenborg's system of chemical and geological evolution is of especial note just here. He reads the succession of early geological strata not as implying successive ages of formation, but as implying layers of coincident formation or preparation, at different depths in the ocean; that is, he reads the geological record in leaves, from the bottom of the ocean up. Thus according to his

[257] Preface to the Treatise on Copper, par. 7.

theory, the growth of the great floating islands of vegetation of the carboniferous age, would be going on at the top of the sea, coincidently with the formation of the submarine vegetation lower down and the deposition of the strata of sediment and the calcareous and silicious oozes in the depths of the sea. Thus, according to him, one and the same age would cover the formation and simultaneous existence of all these layers. And the vegetative crust over the sea, the submarine vegetative world, the lower zones of the deep sediments and calcareous oozes, collecting just above the basic dissolving thinning sheet of rock salt, flooring the sea, would, all, be the offspring of one epoch.

THE SUB-SALINE LAYER, AND ITS CONNECTION WITH THE UPHEAVAL OF MOUNTAINS, THE ACTION OF VOLCANOES, AND THE FORMATION OF MAGNETIC ORES. Hitherto we have treated of the formation of the several strata of organizing life, and the evolution of new substances taking place above the basic rock salt layer. Of the primal formation of that layer we treated somewhat fully in a previous chapter.

But there is one stratum, one layer, which we have not yet mentioned, although it is of the greatest importance. It figures as one of the two agencies which combine in the upheaval of mountain

chains, in the elevation of lands and of islands. Its substance forms the core of mountain chains. It furnishes part of the inner baking heat which metamorphoses the plastic sediment of the ocean bed, when elevated into mountain cones,—into the stuff of our more refractory rocks. In it is the spring of all volcanic rise and overflow; and among conditions existent in it alone, the magnetic ores take their original shaping.

All these several and great uses it enters into, and is an indispensable part and party to. Yet it constitutes probably a layer of no great thickness relatively to the deep rock salt stratum as originally formed above it. It is the sub-saline layer, lying as an intermediate layer in unstable equilibrium, semiliquid, held between the firm crystalline strata which are vaulting above it on the one hand, and on the other the inner rigid, round core of the globe itself which is the most dense solid substance created, wound of ordered lines of fourth finites: cold and dark and firm forever.

The formation of this sub-saline layer was coeval with the formation of the rock salt layer itself. In fact, the lowermost portions of the rock salt stratum pass into it by imperceptible graduations; as the pressure becomes so great the delicate crystalline units themselves are disintegrated or imperfectly

formed. But although it was brought into existence so early in the series of world evolution, the potencies of this intermediate stratum waited to come to their realization and unlocking in use, until that far later world-time arrived when the enormous islands of floating vegetation had become from the accumulation of ages so dense that their mile-deep crust was grown too thick and heavy to sustain itself longer afloat upon the surface of the sea; and vast areas of that vegetative crust, continent wide, broke off here and there, and settled down; at first little by little and slowly, and then swiftly and with heavy vacuum rush, to the floor of the sea. Then the immense body of ocean water displaced, swirled upward, in vast wave, and poured itself in powerful cataract current over the submerging land, till equilibrium was restored and a peaceful sea. And the old story began again, until some new collapse and catastrophe occurred unlocking mighty agencies.

The grounds of our certainty as to the existence of a sub-saline stratum, pasty and unstable, lying between the crystalline floor of the sea and the central rigid ball of the globe, are very simple. The condition of the formation of crystalline or rock salt is, that not all the water particles shall be crushed into the new angular forms, but only a certain proportion of them. The uninjured water

molecules of a certain amount of water of crystalization are necessary for crystalline formation. In fact, they were necessary for the shaping of the very angular particles of the salt, since those angular particles were moulded to the interstices of the water particles.

Now this implies a nice adjustment of the pressure to the work to be done. With too little pressure, salt would not be produced at all. With too much pressure its delicate crystalline shapes would equally fail to be produced. In the latter case there would ensue—not the new form of delicate angular masses, finer than any microscope can hope to see,—beautiful and without break or crushing, modelled into the interstices of the uninjured round molecules of the water of crystalization, by which everywhere they were at once moulded into and sustained in their new shape,—but there would ensue a crushing disintegration of all the water particles, and by consequence the angular forms of the salts would fail to be formed; and the result would be only a pasty, more or less inchoate mass of the various grades of simple component finites. Thus the rock-salt layer with its perfect crystallization could come to birth only in that particular lower zone of the ocean depths where there existed an equilibrium between the pressures and the conserva-

tion of the percentage of intermingled water molecules necessary as moulds for the new and angular forms. Now, in the lowermost ocean deeps, when the universal sea rested immediately upon the rigid planetary core of the grosser metallic finites, at a depth so great that the bullæ of the interfluent third ether[258] were no longer present,[259] but the second or magnetic aura, and the primal aura, alone could be present and ordinative, then, Swedenborg says, the very water particles and the forms as yet created were crushed down and disintegrated even to the point of a disintegration of the larger component finites—or corpuscles—into their own finer constituents;[260] from which would result a layer presenting a sort of pasty mass of intermingled finites, crushed from the materia of the superincumbent sea, just around the original rigid, resistant core of the planet.

Such a result evidently is consequent on a degree of pressure greater than that which gives rise to the crystalline layer of salt formed at the bottom of the primal shoreless sea, the solution of which in the water above, gives rise to the ascending bubbles of

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[258]Principia. part. III. chap. IX. (2). (3). (4).

[259]Chemistry. chap. X. sec. 1. 2.

[260]Chemistry. chap. X. sec. 2. 4.

displaced ether as described.[261] Its site is therefore lower or nearer to the earth's center than the layer of rock salt. Indeed the crystalline layer of the original salt bed, flooring the sea, where it abuts on the rigid earth core, may be assumed to lose its perfect firm crystalline type and gradually merge into the postulated inchoate semifluent mass of pure finites; and is only kept from passing out of its pasty relatively cold state, and fusing and flowing and running into the fiery incandescent state, by reason of the strict limits into which it is coerced by the pressure above it, and the resistance below.

Thus under the solid floor of the primal ocean with its great rock salt layer, and its weight of heaping sediments and swarming life—between that solid floor and the rigid metallic core of the globe, itself compressed from the homogeneous planetary mass into a solidly wound ball of threads of fourth finites alone,—we may assume an intermediate pasty or semifluid layer consisting of heterogeneous finites of various degrees, originally compressed from the lowermost layers of the water of the sea and from the salt itself. Between the core of the earth, which is a rigid solid globe, and the floor

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[261] Chemistry. chap. XI. sec. 5. par. 2. (2). Worship and Love of God. chap. I. no. 14

of the ocean with its strata of crystalline salt and the sedimentary strata of the ages, there existed from the first and exists now, a fluent or semifluent inchoate layer of great instability, held down and together by the pressures and the resistances on either side:—but on the least relief of pressure liable to instant fusion, and the rise of temperature to incandescence.

This layer is the source of the energy of seismic disturbance; it is the spring of volcanic overflow; and its liability to fusion with rise of temperature on the least relief or variation of the coercing pressures was and is one of the two agencies concerned in all upheavals of land or ocean bottom, the elevation of mountain chains, and the sudden appearance, temporary or permanent, of islands in the sea.

The first mountain upheaval of all, the very first lift of the floor of the sea with all its strata upon it into great cone-like ridges, took place in swift sequence upon the subsidence of the first great area of the upper floating vegetative crust to the floor of the sea. Then the weight of that crust was localized upon the portion of sea floor upon which it rested; and coincidently the water mass it displaced seeking place and sucked upward by the vacuum the falling mass created, flowed in great upward currents, rising all about the edges of the

fallen continent,—relatively lessening the pressure there—while the weight of the subsided mass increased the pressure on the sea floor over the area upon which it rested. The sea floor yielded and bent down under the weight of the broad stratum of the fallen upper crust, and at the same moment all around the borders of the depressed area, it lifted and waved upward. To this relative fluctuation of pressure above it, the potencies of the semifluent layer lying between the salt bed and the rigid core of the globe instantly responded, and where the pressure was momentarily lessened, there it fused, flowed, glowed, and upheaved the ocean bed with all its strata on it, into a vast rim bordering the submerged area, and rising higher and higher until a new equilibrium of pressure was reached. This was the formation of the first mountain chain, and this is why mountain ranges border continents, for continents generally consist of interior basins with coast chain rims.

After a new equilibrium of pressure and forces had ceased, the fused mass of the pasty subsaline layer, although it had no more spring and freedom to rise higher, was able to hold its first rise, and cooled, solidified, crystallized as it stood, the original mass being partly sublimed, partly fused, in its upheaval, as the gaseous and glassy inclusions show.

This cooled mass is the igneous granite of which the cores of all mountain ranges consist.

The fiery heat of that great release and fusion acted upon the partially plastic strata of the ocean bed upheaved with the rise of the subsaline layer and lying around and about it, as the heat of the brick kiln acts on the vault of piled brick within which it glows. The nearest layers are fused; all according to their relative distance, are hardened, altered, baked. Thus also the sedimentary strata nearest the igneous rock were literally fused, the silicious into the metamorphic granite, with their evidence of sedimentary origin and crystallization from an aqueous-thermal state, as their liquid inclusions of carbonic acid testify,[262] while the chalks changed into marble. Moreover, all through the metamorphic strata, carboniferous remains and the mineral oils detained still in the deep sea sediment, tended, as the mass reached fusion heats, to be sublimated and precipitated, as veins of pure graphite, characteristic of such rock.

Again, the highly metamorphic rocks, and the

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[262]Le Conte *Principles of Geology*. p. 233. The metamorphic granites the last term of metamorphosis of highly silicious sediments reduced to aqueo-igneous pastyness. Swedenborg. Mics. Obs. p. 14. Granite, from sedimentary strata, originating at the bottom of the diluvian ocean.

igneous rock masses of the mountain cores, as well as in a more marked degree the output of volcanoes, are characterized by the presence of the *magnetic ores*. For only under such conditions and in such localities as preclude the presence of the third or electric ether, while admitting the free entrance of the second or magnetic aura alone,[263] can the magnetic ores or mineral be formed and brought into existence, as in the only matrix appropriate to the production of their peculiar molecular constitution. For the substance of all hard bodies is textured of little bodies,—molecules or least units,—"diversely configurated, as also diversely perforated" with pores large or pores small according to the nature of the composition. Only such little bodies or forms are magnetic, as, however configurated, are furnished with pores or meatuses so subtle as to be permeable by the magnetic elementary or the second aura, but not by the ether, so that the second aura alone is able to pass through their little fixed pores and openings as blood through a vein. With that flow established, the fine tide of the second aura is able to return outside and perfect a true vortex. Such are the least forms of molecules of all mag-

[263]The primal or celestial aura is of course present everywhere, and livingly contains, orders and shapes all things that are.

netic minerals and of iron. Moreover, masses of such bodies as are magnetic are surrounded by a cloud or molecular sphere of free corpuscles of precisely the same nature, each one the center of a least magnetic vortex, the flow of which passes directly through the channels of its minute interior perforations; the latter were indeed formed and kept open by the flux and reflux of that same element, when its constitutive molecular system was laid for it in the deep womb of the earth.[264] To these molecular vortices and their mutual colligation are due the lines of physical force existing around a magnet, and constituting its magnetic force.

Thus it is sufficiently obvious that the purely magnetic ores can originate, and have their distinctive molecular constitution formed only under circumstances and in a situation where the presence of the *third* ether is precluded; and the delicate intramolecular system of pores characterizing the metal is originally ordinated in the presence and under the action alone of the immensely more fine and high magnetic or *second* aura.

Another thing is of interest here. The original cone-like upheavals of the ocean floor lose their

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[264] Principia. part. II. chap. I. n. 10. 15; part. III. chap. V. nos. 4. 16. 21.

pristine height; and that not necessarily by subsidence of their igneo-fluent core, nor by exterior erosive or disintegrative agencies, aqueous or subaerial, although the latter may add themselves, and, in time, finish up and perfect what the main agency does with comparative rapidity and at once. The sedimentary strata of the ocean floor—at the time of their first upheaval, and especially in the primal period of the first upheavals that ever occur,—although compacted, are themselves plastic to a very considerable extent. They cannot be otherwise. Such strata if thrust up from below into a great peak-like cone by an agent extraneous to themselves, will begin, as it were, to slowly slide down hill, and subside and settle down on themselves; each stratum thus widening and spreading out, at the expense of the height of the cone. This process will continue, until arrested by the hardening and metamorphic alteration of substance produced by hill, and subside and settle down on themselves; by this lateral slip,—combined with the heat conveyed into them from the igneous core.[265] This at once accounts for the fact that strata composing mountains are always thicker than the same strata as they lie out over the plain of the general conti-

[265]Le Conte. Geology. pp. 231-232.

nent,[266] and obviates any necessity of presuming the endless geologic ages, necessary to account by known sub-aerial agencies for the present denudation or wearing of peaks, as high as strata of such original thickness would imply. It also accounts for the fact that the younger or later mountains are the higher and still rising; while earlier mountains as representing upheavals of the original more plastic bed of the sea, are the lower and apparently the most lowered and denuded; since the more plastic the state of the ocean floor at its uplifting, the greater and the faster would be its native slip and subsidence; thus the greater the spreading out and thickening of strata thus produced at the expense of their first height, the greater the crumbling of the strata, and the greater the heat evolved by the sideways slip and sideways crushing of the mass, with consequent metamorphic result. All these points characterize the strata of the so-called Archaean Era.

Diluvial cause of what is miscalled Glacial Action and Glacial Drift. When any portion of the mile-thick floating crust of the primal sea settled to the sea floor, and the series of events we have out-

[266] This difference is sometimes from 40,000 in a mountain range to 4,000 over the levels of the adjacent continent.

outlined followed, (*i e.*, an uprush of the displaced water with a coincident upheaval of the ocean bed all around the border of the subsiding continent), we have tremendous agencies set afloat, in the mere action of the water.

In the first place, the waves of gravity initiated at any fluctuant drop and lift of the ocean floor, are great enough to drag bottom even in deep sea, and travel with a known velocity of from 370 to 450 miles per hour.[267] That waves of such type would occur, with every such incident in cosmic history, is apparent. There is also to be reckoned the enormous speeding swirl of the ocean currents, swinging in over the swiftly submerging lands. And with both agencies we can figure on the law that the weight of the fragments a current can carry varies as the sixth power of the velocity.[268]

Thus we can estimate the enormous waves and currents of the sea, set up at every greater subsidence of portions of the floating upper crust; their violence, their power to tear off even mountains and slide them along over the passing bed of their irresistible flow, boring and graving the strata beneath in correspondent channels and flutings as if

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[267]Le Conte. Geology. p. 130-132.

[268]Le Conte. Geology. p. 20.

they carried graving tools; while lesser rocks, borne from their far native place, as sediments and finest pebbles are borne by quieter, slower streams, were posited in heaps and drifts, along their flow. The piles of such remains of successive diluvial disturbances, appear as the scattered rock drift of our lands to-day.[269]

METALS AND METALLIC ORES, PRODUCED THROUGH THE IMPREGNATION OR INFILLING OF FORMS ALREADY CREATED, BY FREE METALLIC FINITES. RELATION OF THIS TO THE APPEARANCE OF METALLIC PROPERTIES IN THE HEAVIER MEMBERS OF ALL FAMILIES OF THE PERIODIC SYSTEM OF CHEMICAL ELEMENTS. In addition to the creation of the lighter alkaline metals in the salt of the sea, and the formation of the heavier magnetic metals, chiefly in and around mountains where the third ether is barred out and the igneous and metamorphic traits are most marked, there occurred a later, very wide-

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[269]Preface to Treatise on Copper. par. 5 to 7. Chemistry. chap. I. On Primeval Ocean. Misc. Obs. part. I. pages 5 to 9 inclusive. p. 10. sec. I. p. 156. *Appendix.*—On the waters of the Deluge and their action. Compare with the above Howorth's work "The Glacial Nightmare," in which Swedenborg is credited as the first man who taught the diluvial origin of drift; a teaching which Howorth competently endorses.

spread infiltration and interpenetration of free metallic particles or primitives into the very corpuscles of forms already created. Thus three geometrical types of forms (rendered as it were metallized, more inert, and heavier), resulted from this action in the course of time.

If by an accession of free third finites, the fifth finites composing the envelope of the water particle were entered, and as it were infilled and fixed, then would result a globular metallic form, called the mercurial globule,[270] and also the metallic oil globule.

A comparison with *Principia,* part III. chap. VIII, (where it is noted that the third finites, free and active, cannot be in the same space as fifth finites, without disturbing their motion and so interpenetrating them as to cause them to become non-active; nor the second finite, free and active, with the fourth), suggests the condition of the fifth finites composing the envelope of the water particles, when *interpenetrated and infilled by an accession of third finites* free and active. In such an impregnation and infilling of the fifth finites as produces the round metallic particle called the mercurial globule, it is evident that the water particle becomes transformed, and the fifth finites heavier

[270]Chemistry. chap. XXV. 133-138.

and more inert. A like infiltration or impregnation of the angular salt particles takes place,—fifth finites of salt particle being infilled by free third finites, and the fourth finites being infilled by second finites.[271] In the case of the cubic particle,—the alkaline metal,—of the salt, this apparently produces the heavier members of the alkaline and earthy metal family; all more inert, of greater atomic weight, and of physical characteristics more obviously those we associate with the term metal.

In the case of the triangular or acid particles of the salt, this metallic impregnation of the original form seems to result in the constitution of the heavier, more inert later members of the various periodic families concerned, and probably accounts for the fact that even those periodic families which in their first most active and lightest members show no slightest trace of metallic characteristic, do show such characteristics markedly in their later members all of which possess also greater chemical inertia and greater atomic weight.

The constitution of lead, Swedenborg says, is framed both of such metallic round particles or globules, and of the infilled metallic cubes. That being so, the presumption would be that comparatively quiet and undisturbed sedimentary strata

[271] Chemistry. chap. XXV. no. 5.

would be most likely to afford the necessary matrix of perfect cubes, and perfect round water particles, in the orderly juxtaposition. This, perhaps, is the cause of the fact that while the ore deposits of other metals are formed chiefly in the vicinage of mountains characterized by metamorphic features, lead is an exception to the general rule, being associated largely with quiet sedimentary strata; its formation probably belonging to rather later eras.

Such, according to Swedenborg's system, is an outline of the cosmic causes and effects of the successive diluvial catastrophes; and such their gracious use in the Divine Providence "that all that was hidden in the bowels of the earth and all that the planet had gained by successive series of changes and multiplied events, in this manner should be made available to the use of mortals, which it seems could not have been the case had not the terraqueous globe been forced to submit to disruption, and to the oppression of the deluge. . . . In this way matrices and ores were carried to the coldest regions of the earth; which results would probably have been impossible unless the planet had been violently treated in the way above described, and made patulous in various places, and so had received throughout its surface an insemination of fit materials."[272]

[272] Preface to work On Copper.